DOCUMENT RESUME

ED 048 776 24 EM 008 850

TITLE	CITY III Director's Guide.
INSTITUTION	Envirometrics, Inc., Washington, D.C.
SPONS AGENCY	Office of Education (DHEW), Washington, D.C. Bureau of Research.
BUREAU NO	BR-9-0515
PUB DATE	Oct 70
CONTRACT	OEC-0-9-180515-4530(010)
NOTE	181p.; See also EM 008 848, EM 008 849, EM 008 851, EM 008 852
EDRS PRICE	EDRS Price MF-$0.65 HC-$6.58
DESCRIPTORS	City Demography, City Government, City Planning, Computer Assisted Instruction, Computer Programs, Decision Making, Educational Games, *Guides, *Management Games, Metropolitan Areas, Models, *Simulation, *Teaching Guides, *Urban Areas, Urban Environment
IDENTIFIERS	*CITY III

ABSTRACT

CITY III is a computer-assisted simulation game which allows the participants to make decisions affecting various aspects of the economic, governmental, and social sectors of a simulated urban area. The game director selects one of five possible starting city configurations, may set a number of conditions in the city before the start of play, and may have a continual effect on the play through the use of the many director options. This manual details the responsibilities of the director before the start of play. It describes what the director needs to know in order to operate the model, influence play, and answer participants' questions that are not fully covered in the Players' Manual. The input-output procedures are outlined for operating a round of play on the Univac 1108 system. Some of the major computer options, including employment and commercial processes, migration, and outside systems, are explained in some detail. Such complementary exercises as elections, town meetings, mass media, and legal systems are suggested. Supplementary material includes a scenario for each of the five starting city configurations and an annotated bibliography on gaming and simulation. (JY)

ED048776

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY

CITY III

DIRECTOR'S GUIDE

ENVIROMETRICS, INC.

October, 1970

EM 008 850

INTRODUCTION DIRECTOR'S GUIDE

A. Director's Role

As the director of a play of the CITY III Model, you select the starting city configuration used by the participants, change a number of conditions in the city before the start of play, and have a continual effect on the play through the use of the many director options.

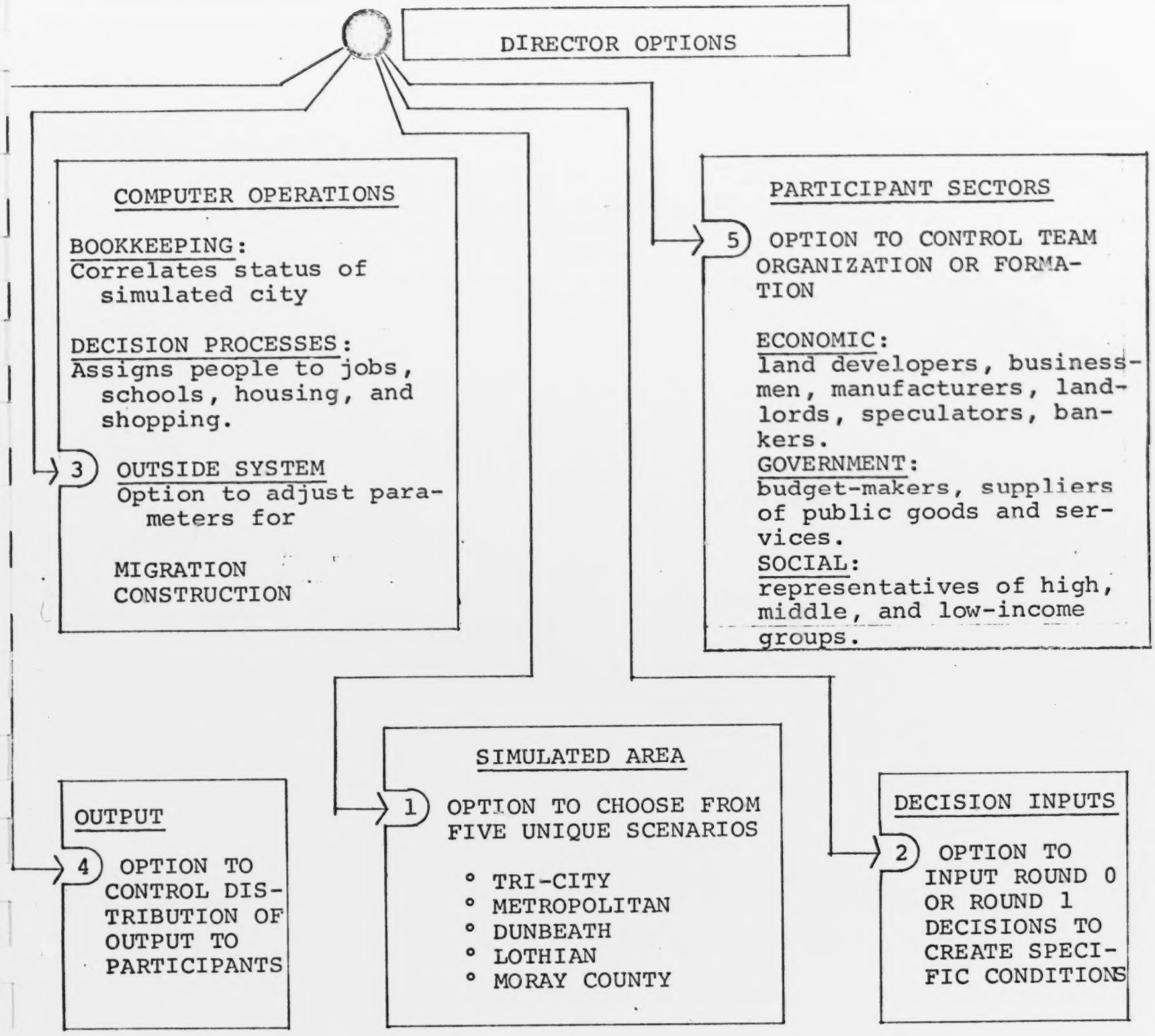
The figure on the next page shows your position in relation to the computer operations, the simulated city area, and the participants. As director, your first choice (once you have determined the overall objectives of using the CITY III Model and assembled a group of participants) would be to select one of the five initial starting positions. Each of the starting positions has the city's resources distributed among the sector teams and specified cash balances in the accounts of the economic and government teams. The director may alter many of these initial starting characteristics by making inputs to the computer before the participants begin play. The director can continue to influence the play throughout its duration by making further inputs, acting as the Outside System, and distributing the computer output in various ways. The director can also affect the play tremendously by how he forms his teams and what responsibilities he assigns to groups of players or to individuals.

The director, then, may be as active or passive as he desires. Operating CITY III does not require the director to influence the play or make inputs, but the model does allow him to control play if he wishes to.

B. This Manual

This manual describes what the CITY III director needs to know in order to operate the model, influence play, and answer participants' questions that are not fully covered in the Players' Manual. The director, of course, should be thoroughly familiar with the Players' Manual.

This manual focuses on four major points:


DIRECTOR OPTIONS
COMPUTER OPERATIONS
BOOKKEEPING:
Correlates status of simulated city
DECISION PROCESSES:
Assigns people to jobs, schools, housing, and shopping.
3 OUTSIDE SYSTEM
Option to adjust parameters for
MIGRATION
CONSTRUCTION
PARTICIPANT SECTORS
5 OPTION TO CONTROL TEAM ORGANIZATION OR FORMATION
ECONOMIC:
land developers, businessmen, manufacturers, landlords, speculators, bankers.
GOVERNMENT:
budget-makers, suppliers of public goods and services.
SOCIAL:
representatives of high, middle, and low-income groups.
OUTPUT
4 OPTION TO CONTROL DISTRIBUTION OF OUTPUT TO PARTICIPANTS
SIMULATED AREA
1 OPTION TO CHOOSE FROM FIVE UNIQUE SCENARIOS
° TRI-CITY
° METROPOLITAN
° DUNBEATH
° LOTHIAN
° MORAY COUNTY
DECISION INPUTS
2 OPTION TO INPUT ROUND 0 OR ROUND 1 DECISIONS TO CREATE SPECIFIC CONDITIONS

1. Responsibilities of the director before the start of a play (including choice of city, formation of teams, instruction, and motivation). (Chapter 1)

2. Operating a round of play (including distribution of output, length of round, motivating play, making decisions, and inputting decisions). (Chapter 2, Appendices A, B, C, D, E, F)

3. Complementary exercises and materials (including elections, town meetings, mass media, legal system, special projects and outside readings). (Appendices H, I, K)

4. Explanation of some of the major computer operations (including employment and commercial processes, migration, outside system, and many others). (Appendix G)

As you will notice, this manual is organized with only two chapters but eleven appendices. The two chapters contain unified and sequential information. The appendices, because they each contain complementary information on different aspects of play, do not sequentially follow the first two chapters.

Reading the Players' Manual and the two chapters of this manual will give you sufficient knowledge to run an adequate play of CITY III. By also reading the appendices, you will be able to direct a play that will not only be more interesting but be more rewarding for the participants and yourself as well.

C. A Round of Play

You should understand the use of the term "round" and how rounds are numbered. The director/operator must deal with two rounds: the player's output is known as a "round," and the data base stored in either a tape file, or as it remains in the computer system, is a "round" of data. Players make decisions from a data base numbered the same as the round of output with which they are playing.

Thus, care should be taken in discussing "rounds" with the players, computer installation staff, or the operator to avoid misunderstandings.

A Round 0 data base is only produced by the execution of the LOAD program. LOAD produces no round of output. Consequently, once LOAD has generated an initial data base, a subsequent round of output along with a subsequent round's data base (both of which have the same round number) can only be produced through the execution of the simulation (CITY3) on the previous round's data base (perhaps altered by EDIT). Thus, only execution of CITY3 produces a new round of output and a new round's data base, both numbered the same. An altered round is the data base generated by the execution of the EDIT (input processing) program to the players' round decisions. That data base retains its round number; e.g., EDIT executed on the Round 1 data base generates an altered Round 1 data base.

TABLE OF CONTENTS

		Page
I.	BEGINNING OF PLAY	1
	A. Choice of City	1
	B. Formation of Teams	6
	1. Altering the Number of Teams . . .	6
	2. Making Teams Operate Across Sectors	7
	3. Changing the Resources of a Team .	7
	C. Distributing General Output	8
II.	RUNNING THE ROUND	9
	A. Prefatory Notes	9
	B. The Computer Round	10
	C. The Players' Round	13
	1. Game Formats and Strategy Formulation	13
	2. Director Interaction with the Players' Input Procedure	25
	3. Director Input Decisions	26
	4. Putting in Decisions and Punching Cards	33

APPENDICES

A. Player Thumbnail Decision Checklist by Sector: Economic, Social, Government (11 pages)

B. Flow Diagrams (4 figures)

C. Inputting Decisions in the CITY III Model (12 pages)

D. Edits (30 pages)

Appendices (continued)

E. Maximums and Minimums in the CITY III Model Input and Files (5 pages)

F. List of Output Sections (10 pages)

G. Elaboration of some Player and Computer Processes (38 pages)

H. Optional Game Formats and Suggestions (6 pages)

I. Scenarios for the Five CITY III Configurations: Metropolitan, Tri-City, Moray County, Dunbeath and Lothian (10 pages)

J. Definition of Land Use Types (2 pages)

K. Simulation and Gaming -- A Select Bibliography (5 pages)

CHAPTER I

BEGINNING OF PLAY

A. Choice of City

The game director may select one of five initial starting configurations representing rural and urban areas of varying sizes. In determining what city to play, the director should consider the factors summarized in table on page 2. In addition, scenarios for each city are included as Appendix I.

In one of the optional cities, the CITY III model focuses on a micro-view of an urban area by reducing the level of aggregation. In this option, Lothian, the population is reduced ten times so that each population unit equals 50 persons (instead of 500) and each unit of linear measure equals one-third of a mile (instead of a mile). Hence, in four of the cities, each parcel is equivalent to one square mile of land; and in Lothian each parcel is equivalent to one ninth of a square mile of land. The reduced scale values are reflected in the second set of master sheets accompanying the players' manual. This set should only be used when playing Lothian.

While the small scale enables a player to better relate everyday experience and environment to the factors in the model, that focus makes it impossible to consider things covering a large geographic area. Players interested in developing an integrated multi-modal transportation network would be frustrated in attempting its implementation in a small town, small scale environment. A metropolitan area represented on the large scale is a better area in which to test such a system. One potential drawback of the large scale to the players, however, is that this scale sometimes presents difficulties in conceptually dealing with activities which represent sizeable aggregations.

Scale is tied directly to the starting configuration. As Lothian can only be played small scale, every round of play is at that scale. Consequently, playing a particular scale level can only be accomplished by playing a particular city.

BASIC CHARACTERISTICS

CITY NAME	METROPOLITAN	TRICITY	DUNBEATH	LOTHIAN	MORAY COUNTY
POPULATION	1,548,500	601,000	275,500	50,000	11,500
POPULATION SCALE	P1 = 500	P1 = 500	P1 = 500	P1 = 50	P1 = 500
TOTAL MARKET VALUE OF PRIVATE DEVELOPMENTS (in millions of $)	9,286	2,504	90	14	9
PUBLIC DEBT (in millions of $)	336	355	39	13	8
NUMBER OF DEVELOPED PARCELS	245	136	59	173	19
CPU TIME	17 minutes	5 minutes	3 minutes	6 minutes	2 minutes
PAGES OF OUTPUT	260	280	220	240	160

FIXED MODULES

JURISDICTION	2	3	1	1	1*
STARTING ECONOMIC TEAMS	10	10	7	10	4
MAXIMUM ECONOMIC TEAMS	10	10	7	10	10
SOCIAL TEAMS	10	10	7	10	10

USABLE MODULES (Starting)

RAIL	Yes	Yes	No	No	No
BUS	Yes	Yes	Yes	Yes	No
PREEMPT LAND	Yes	Yes	No	Yes	No
PUBLIC INSTITUTIONAL LAND	No	Yes	Yes	No	No
LOCAL CONSTRUCTION INDUSTRY	Yes	Yes	Yes	Yes	No
ASSESSMENT	Yes	Yes	Yes	Yes	Yes

*The director has control over two additional jurisdictions, each of which is composed of 4 parcels (square miles).

Besides the figures in the table on page 2, the director has a virtually unlimited source of starting configurations. By making input decisions on the Round 0 (pre-starting round)[1] data base, the director may create a virtually infinite number of starting positions. The following table suggests ways that the initial starting base can be restructured by a combination of director options and what are normally player decisions.

1] In the case of population changes, the inmigration options are first exercized during the EDIT program which precedes round 2 (i.e., on the Round 1 base).

Decision Type and/or Director Option for Pre-Round 1 Adjustments	Sector Directly Affected	Basic Results of Action
Vary number of in-migrants[1]	Social	Population by class increased or stabilized
Choose construction facility Local Construction Industry	Economic, Government	Round lag for completion of construction projects (each takes one year to build). Player operation of CI including: negotiation of contracts; local employment, etc. Local CI is choice unless director specifies otherwise.
Construction, Demolition[2]	Economic, Government	Developed area of city is changed.
Cash Transfer	Economic	Round 1 cash balance can be altered. More cash usually leads to more developments.
Cash Transfer	Government	Operating subsidies provided or great budgetary pressure applied to departments.
Public Land (Preempt)	Economic	Land made either undevelopable or open for developments if land was previously undevelopable.
Decisions normally under player control	Social, Economic, Government	Alter use indices (change employment); wage and/or price structure changed; improve or hamper public services, etc.

1] Since the migration routine is first operated at the beginning of round 2, this director option may first be exercised during EDIT before round 2.

2] Decision-maker for whom construction and/or demolition is being contracted must have sufficient funds in his account. Note that in none of the starting configurations does any construction industry have outstanding contracts (including the Outside). Thus, without director inputs (Round 1 EDIT) no construction industry will receive income, nor will any new developments appear in Round 2 in the case of YESCI or in Round 1 in the case of NOCI.

An explanation of the public land use and construction modules and what these options imply in terms of play and model structure is given in Chapter II, page . More fully illustrated uses of normal player inputs to the modules listed above are included in Chapter II's discussion of director options.

Since construction strongly affects the economic and demographic structure of the simulated area, the players should be made aware of the start of play which version of this routine is being employed. The potential consequences of their using it should be highlighted also. For example, choosing the option of whether, once contracted for, construction is performed immediately in a round or with a round lag makes considerable difference to an economic decision-maker. Moreover, since construction causes rapid expansion, it pressures the government to react more quickly to economic development.

B. Formation of Teams

A list of economic, social and government teams and their major characteristics is given as part of the description of each starting configuration. The director may desire to modify the number of teams, have a group of participants play more than one team simultaneously, or change the composition of a team.

An increase or decrease in the number of social teams can be accomplished simply by combining or separating the output that presently is available as in the first example of economic teams. Since social teams do not have any output that is comparable to the cost statement and land summary statement in the economic sector, social output can be combined or separated with greater freedom. The social output is already separated by class and by jurisdiction, thereby providing a straightforward basis for further division among participants.

1. Altering the Number of Teams

For example, let us assume that there are seven economic teams, but that the teacher wants only four. The reduction in the number of teams may be accomplished by either allocating the seven economic sets of output among four groups of players (this is the least complicated method because no input need be made to the computer) or by dividing the assets of the last three teams among the other four teams (this requires a set of input cards that indicate the purchase at zero price of the latter three teams' assets by the former four teams). 3]

Another example, let us assume that there are seven economic teams and the director wants ten. This can only be accomplished if the starting configuration permits additional economic teams, each of which has no assets or liabilities (Moray County is a case in point). Through inputs on the Round 0 base the zero balance teams may be given only cash, or they may be given land and developments from each of the four original teams.

An increase or decrease in the number of social teams can be accomplished simply by combining or separating the output that presently is available as in the first example of economic teams. Since social teams do not have any output that is comparable to the cost statement and land summary statement in the economic sector, social output can be combined or separated with greater freedom. The social output is already separated by class and jurisdiction,

---

3]In this latter case no liabilities can be transferred.

thereby providing a straightforward basis for further division among aprticipants.

2. Making Teams Operate Across Sectors

The director may also wish to have a group of participants play several sector roles at the same time. For example, he might give a three-person decision group the economic output for Team A, the social output for Team AA, and the government output for the School Department and ask the group to play all three sector simultaneously.

An alternative would be to have decision groups act as both economic and social teams, with individuals elected and appointed to the government teams. This would not only give every player an identification with an economic base and social interest group, but also allow him to perform as an individual in the Government Sector.

3. Changing the Resources of a Team

The director may wish to alter the resources of an economic or government team. The extent to which the director may do this might be as little as changing the cash holdings or add debts, or as extensive as changing all the economic holdings so that each economic team has only one type of development. In this latter change, one team could control all the HI, another team all of the BG and BS, and another team all the RA housing of a certain quality index or in a certain area of the city. Conversely, the director could change all of the economic holdings to represent geographical interests rather than functional specialization.

C. Distributing General Output

The director can be selective in how he distributes the general computer output. In order to introduce the participants gradually to the complexity of play, the director might choose not to explain and post all of the general output. Such information as the employment diagnostics and the commercial diagnostics might be withheld until the players request such information or until such time as the director feels that this output should be introduced.

Moreover, the director may choose to permanently withhold some of the output and simply "sell" information from the output to players who pay the price designated by the director. This payment can be deducted from the team by inputting a cash transfer to the outside. (See Chapter II, page 26.) He could do this because the information provided by some of the general output is much more than is typically available in the real world. Thus, the team payments for information could represent special surveys and research studies.

Likewise, the director may wish to withhold some roles from participant involvement until such time as he feels appropriate. For example, Bus Department, Rapid Rail Department, and Assessment Department may all be left to run automatically until the director chooses to hand the decision-making power over to the participants.

CHAPTER II

RUNNING THE ROUND

A. Prefatory Notes

In order to distinguish between the technical round and the game-room round, it is essential to provide both background information on the sequence of the computer operations and illustrations of the actual play sessions which the director conducts. The technical round [A] involves computer processing of the players' decisions and the subsequent simulation which traces a year's activity, while the game-room round [B] entails the players interacting in making decisions. On the latter, this chapter will offer several suggestions toward instituting a decision-making process, and expand on the director's options listed in Chapter I.

The importance of how teams are formed and the game-room is organized, policies which precede the first round of decision-making should be re-emphasized here. These procedures, highlighted in the first chapter, greatly influence what direction the game-room round will take. The remarks in the first chapter complement future discussions of the play.

B. The Computer Round [1]

In a typical play of CITY III, the computer round begins with the EDIT program processing player inputs. This program rejects any improper or invalid decisions and records the changes specified by the correct decisions. Appendix G gives a detailed explanation of the error messages caused by improper or invalid decisions. After director and player inputs have been processed, the program and data base are ready for the execution of the simulation.

The routines composing the simulation (technically known as CITY3) and what each routine produces are listed below in the sequence in which they are processed. The right hand column is a breef description of what each routine does. Routines marked by an (*) are further described in Appendix G. Furthermore, the computer processes fully each routine only (1) once and (2) in the order listed below. Inputs for each routine are only processed during a routine's "turn." Note that each of these operations changes the data base encountered by routines executed later in the sequence. For example, the employment allocator (5 and 6) generates employment figures which the commercial allocator (13) uses in order to determine the effective capacity (the actual level of operation) of commercial establishments.

NAME OF ROUTINE		RESULTS OF OPERATION
*(1)	MIGRATION	Calculates population unit dissatisfaction and moves people into, out of, and among residences in the board area. Diagnostics are printed.
*(2)	ASSESSMENT	Assesses all privately owned land and buildings. Prints series of six maps and assessment department's output.
(3)	DEPRECIATION	Depreciates all developments, except roads, as a function of the development type (annual depreciation rate), MS use index, and usage.
(4)	MAPS	Prints the five updated status maps reflecting the new round's changes before maintenance.

[1] For a technical discussion of the programs and how to execute them, refer to the Operator's Manual.

(5)	FULL-TIME EMPLOYMENT	Assigns workers to jobs and to the transportation mode and route from home to work. Prints diagnostics in "per worker" terms.
(6)	PART-TIME EMPLOYMENT	Assigns P1 part-time work units to jobs on same basis as full-time. Prints diagnostics.
*(7)	SCHOOL ALLOCATOR	Assigns students (children) to schools in their district or to private school. Prints "School Map."
*(8)	ADULT EDUCATION	Assigns P1 (PM and PL adult) time units to public education on basis of time allocation and available capacity (by jurisdiction).
(9)	MUNICIPAL SERVICES	Calculates total usage (units drained) for each MS plant.
(10)	CONSTRUCTION INDUSTRY ACCOUNTING	Determines contract status of each project (either "pending" or "deferred").
*(11)	FINISH TIME ALLOCATION	Allocates time units remaining after time consumed for trip to work to part-time work, adult education, politics and recreation (up to player-specified amounts).
(12)	PARK USAGE	Assigns P1's to parkland
*(13)	COMMERCIAL ALLOCATION	Assigns customers to commerical establishments, renovates all developments except BG and BS, depreciates and renovates roads. Prints commercial diagnostics.
(14)	TERMINAL ALLOCATION	Assigns all HI, LI and BG to terminals. Prints diagnostics map.
(15)	SOCIAL AND ECONOMIC OUTPUT	Calculates income and expenditures for all P1's, businesses, and economic teams. Prints this information plus the other characteristics of each social and economic team.

(16)	HIGHWAY OUTPUT	Calculates Highway Department income and expenditures, floats current bonds if necessary, and prints status map.
(17)	HIGHWAY MAP	Prints a map of the road network.
*(18)	BUS COMPANY OUTPUT	Prints bus company status.
*(19)	BUS AND RAIL ROUTE MAP	Prints four maps of bus and rail networks.
*(20)	RAIL COMPANY OUTPUT	Prints rail company status.
(21)	SCHOOL OUTPUT	Prints school system status, adult and children, by jurisdiction.
(22)	PUBLIC OUTPUT	Prints MS map and status, UT map and status, Planning and Zoning maps (3) and status, and the Chairman's report. Each status report is by jurisdiction.
(23)	SUMMARY OUTPUT	Provides summary statistics of board area activity plus a diagnosis of National Economy (outside) conditions and transactions.
(24)	ACTUALIZE BUILD	Enables pending construction projects to appear completed at start of next round.

C. The Players' Round

In a round of play participants analyze their output maintain game-room communications, develop short and long term objectives, and submit their formal decisions. While the CITY III Players' Manual supplies the information and basic mechanics that the players require to complete the first task, the director commands a large amount of influence over the other three phases of the decision-making process.

There is little danger of rigidity in starting a play within a certain framework. CITY III is flexible enough to accommodate any degree of restructuring from one round to the next. On the other hand, a laissez-faire approach to directing the play may be appropriate and clearly possible. Caution should be exercised, however, in allowing first-time players to begin in this fashion as the absence of all framework may lead to disjointed game play.

Since any game objective implies a certain team formation, communications network, and strategy formulation, the director should devote some time to organizing these areas. Team formation was discussed in Chapter 1. The communications network has its foundation in the logistics of the play (where the teams are located and their proximity to other sectors, etc.) and in how the output is distributed (see Chapter I also). Additional means of communication include those provided by a mass media, governmental regulatory agencies, and ad hoc "citizens" committees. These and other suggestions are discussed more thoroughly in Appendix H. The final areas of Director organization are discussed in the remainder of this chapter.

1. Game formats and Strategy Formulation[2]

Strategy formulation, which encompasses the total environment of the decision-making process, is an area where the director can best instruct and "guide" the players. While the developers of CITY III encourage the director to exhibit as much creativity and imagination in terms of game motivation as possible, this manual provides suggestions to assist the director in producing a meaningful play.

2] Appendix H contains discussion of the following formats and means of game-room communication: mass media; federal-state aid controller; data and information consultant; alternative forms of government; legal system; insurgency; holding corporations; building inspector; citizen commissions; and citizens interest groups.

Given any game format, a limited subset of strategy formulations is defined. Therefore, selection of a game format implies player assignment to roles which have recognizable objectives. Thus, the director should be wary of restrictions to flexibility which a particular format prescribes. On the other hand, the specification of a format may enable the participants to involve themselves in the game, a situation which may not have obtained without early direction. Moreover, once involvement occurs new formats and strategies will undoubtedly evolve.

Seven format suggestions are listed below. None are developed fully here and there are no detailed examples of the manner in which they would be implemented. Nevertheless, the brief descriptions should enable the director to conceptualize the structures implied in the formats. Unquestionably, this area will become much more comprehensible to the director when he acquires a working knowledge of the model and its processes.

One. Develop an analogy between the dynamics of the game and real world problems of decision-making.

Once the participants comprehend the functions of the decision-making teams, an effort should be made to interpret their output in terms of real-life situations. Utility units become kilowatt-hours; adult education becomes vocational training, on-the-job training, and the pursuit of college degrees.

The players should consider their very localized interests and competitive relationships. Finally, each problem can be identified as though it were a real world phenomenon which can only be acted upon through real world means. For example, poor police service results in more crime. What solutions are available: hire more police, provide more facilities, etc.?

Two. Deal with real world issues as though unrestricted by the components of the game. (The converse of One.)

Insure that the players have little or no prior knowledge of the game. Let them formulate the issues and problems of urban systems, particularly as they relate to the individual participant: should public schools be eliminated; should neighborhoods have autonomy over school boards; what good is a metropolitan government; are corporations economically feasible?

Isolate each issue and illustrate through a segmented play of the game how such a program or situation could be implemented; identify the impediments to implementation, and the simulated consequences of the action.

For example, it is posited that a natural (or man-made) disaster of catastrophic proportions would completely disable a city, precluding any reconstruction or even survival. The director could put in numerous demolitions and decreases in levels of hiring capacities for departments and then run several "years" of simulation. The game's activity following such an event would present a basis for provocative debate around such questions as "what would have happened if ....?" This debate in turn, would generate more demonstrations and more real world involvement.

Three. Operate all functions to achieve goals called for in a Master Plan

Communities often develop Master Plans to guide future growth. While the players would be required to participate completely in the decision-making if this format is used, they will soon become aware of how inflexible and limited their options are. Each potential decision from all sectors would be subjected to careful scrutiny to insure that nothing would cause deviation from the path intended to lead to a common objective.

Analysis of the decisions, the development of the plans, and evaluation of the psychological effect of narrowing player motivations are three fertile areas for growth of ideas and interpretations.

Four. Restrict the evaluation techniques of each decision-maker to those of cost-benefit analysis.

For some decison-makers, this specification requires that they translate intangibles into dollars-and-cents terms. The assumptions and philosophies they use in making this first step of the total analysis merit classroom investigation. Note that applying time-dollar-value decisions to the social sector is a microcosm of this approach.

Under this format the participants must thoroughly understand their roles and the game components which affect their activities, population units, and the like. Subsequently, each alternative decision can be

processed in a fixed pattern: any possible move is sorted into a cell with all other actions having related effects; the combined costs (such as those from increased prices of personal goods if a shopping boycott is begun, or decreased current expenditures from not improving the municipal services use index) must be compared to both projected immediate benefits such as loss of revenue in economic sector due to lower maintenance expenditures caused in part from the second action stated above, and long-term effects (again for the second case, outmigration of population units).

The manner in which this format is described implies that most decision-making is done by making a cost-benefit analysis. This is not necessarily the lesson or intention of this format, as strict adherence to this approach removes intuitive responses and probably encourages a strictly ordered play. Obviously, there are drawbacks as well as benefits to this format if such a result is obtained.

The following two examples suggest game formats which are actually sub-formats of a play. Thus, either one could be incorporated while a larger theory is applied to the whole play.

Five. Operate the government departments autonomously.

Remove the larger bureaucratic structure of the government by making each department responsible only to itself. The departmental decision-makers could be either appointed by the game director or elected individually by the social sector and/or the economic sector. In either circumstance, intense self-interests and competitive instincts could develop for each department and even for each jurisdiction. The director should control all departmental financing.

Some of the consequences of this format include the alliances between a social or an economic team and a particular department.

Six. Organize the economic teams so that they act as a single unit.

In effect, the economic sector becomes one team. This format, where the economic sector is an oligopoly, could easily evolve to many illustrations of other nations' political and economic structures. Regardless of whether or not lessons on political economy are important

to the director, perpetual confrontation between sectors is obviated. The consequences of these confrontations should provide several experiences in the machinations of power.

A variation of this economic format is the collusion of social teams into a strong civic organization and/or political power base. Both sectors would then be vying for control of the government sector which holds monetary and other rewards for the controller.

Seven. Encourage a zero population growth policy

By exercising the inmigration option, the director can effectively stabilize the population. This would allow the players to adopt a zero population growth policy and attempt to carry it out. The players might be convinced that the best policy they can undertake as a group is to increase the satisfaction of the people living in the local system. Thus all attention could be placed on the quality of decisions given an overall population level.

To carry out such a policy, the economic incentives required, the population regulations needed, the economic growth (quantity) foregone, and the public services levels required would be illustrated. In an environment with a stable population, the transportation decisions and land use decisions would be linked together to provide a played-determined optimal locational pattern within the constraints provided by the initial starting conditions and the available capital.

The players would be made aware of the difficulties involved in maintaining a standard of living in a stagnant economy. The outside system would take on a different meaning since most of the players' investments would have to be made in conservative and speculative outside investments. The development of a favorable balance of trade between the local and outside system would become crucial. Outmigration would have to be guarded against.

In summary, the players would be faced with a unique public and private policy challenge that has not been afforded to many real life decision-makers on a voluntary basis.

Even after a format is fitted to a play and the players are cognizant of the objectives of the game, some may still encounter difficulty in organizing their individual actions. While the circumstances of player failure to operate in a decision-making context is unlikely, a particular strategy formulation technique is included to aid the director if such a barrier is encountered.

The strategy is simply a sequence of actions to be taken by an individual player: identify a problem; probe it with questions; search the output for answers; develop alternative decisions; implement some of them; and re-analyze the problem on the basis of those decisions. The particular context from which the following examples are drawn is a format equivalent to the first one above and to the standard formation of teams into separate sectors, with separate control and responsibilities within each sector.

Players should be able to identify dozens of problem areas which could be analyzed in a similar fashion. Consequently, the director may wish to sketch a master form from which the players could proceed to develop decisions as a learning exercise.

DECISION-MAKING SEQUENCE:

1. IDENTIFY THE PROBLEM

Economic decision-maker B discovers that his BS1 at 9832 lost money after receiving earnings at a ten percent rate of return in a prior round.

2. RAISE QUESTIONS

- What is the competition?
- Is there enough demand to support all the BS establishments?
- Was the supply (effective capacity reduced?
- Are costs too high?

3. ANALYZE THE PROBLEM

- Is the price competitive?
- Are there locational disadvantages?
- Are there boycotts against the BS at 9832?
- Is the value ratio adequate?
- Did the BS receive a full complement of employees?
- Is the MS use index greater than 100?
- Are taxes high?
- Are utility prices high?

92

4. SOURCES OF REFERENCE	* 46, 47, 48	* 20, 46, 48	* 55	* 53	* 53	* 53	* 53, 54	* 53, 76
5. DEVELOP ALTERNATIVE STRATEGIES	Lower price; encourage or pressure for highway development for better access		Search cause of boycott; encourage growth of user industry in immediate vicinity.	Raise the maintenance level; raise salaries.		Force Govt. via: 1. Threats, removal/no expansion of economic activities; new power base. 2. Argument: more income = more income revenue.		
6. DESIRED RESULT	Greater demand due to lowest cost principle		Increased demand due to growth and/or removal of boycott.	Increase production by expanding design capacity and employment effect.		Incur no depreciation due to MS use index; lower property and sales tax payment; lower utility costs.		
7. REVIEW & EVALUATE	1. Observe actual results and compare with desired result, 2. Measure effectiveness of strategy with respect to both present and future, 3. If necessary, recycle.							

*Numbers refer to list of output sections (Appendix F)

DECISION-MAKING SEQUENCE:

1. IDENTIFY THE PROBLEM

Social decision-maker DD learns from his jurisdiction 2 low-income class output that his low-income population units residing on parcel 9824 had sizeable debt during the past year.

2. RAISE QUESTIONS

- Was full-time employment adequate?
- Did they take part-time jobs?
- Transportation expenditures too high?
- Were other expenditures inordinate?

3. ANALYZE THE PROBLEM

- Are there major PL employers nearby?
- Is education level competitive?
- Are salaries better than typical?
- Was time allocated for extra work?
- Is educational level competitive?
- Are there bus routes available?
- Is time-dollar-value set low?
- Is road network adequate?
- Are rents/prices/taxes high?
- Are there school/ad. ed. expenditures?
- Is there too much time in recreation?

4. SOURCES OF REFERENCE	* 20	* 5a, 85	* 28	* 51a	* 51a, 85	* 62	* 51a	* 61	* 51a 33 38 84	* 51a	* 51a
5. DEVELOP ALTERNATIVE STRATEGIES	Pressure gov't for growth policy, allocate time to adult education, threaten boycott			Allocate time to adult education and extra work		Lower time-dollar value; push for new routes and lower fares; become highway lobby			Boycott, back new candidate, decrease costly time allocation		
6. DESIRED RESULT	Increase full-time wages			Supplement income with part-time job		Use cheaper transportation modes to work; have better access to PG's and PS's			Lower and/or eliminate expenses		
7. REVIEW & EVALUATE	1. Compare results as reflected on new output with anticipated results. 2. Evaluate effectiveness of strategies taken; 3. Prepare to recycle and coordinate new strategies; 4. Perhaps implement previously discarded alternatives.										

*Numbers refer to list of output sections (Appendix F)

DECISION-MAKING SEQUENCE:

1. IDENTIFY THE PROBLEM

The Municipal Services Department in Jurisdiction 2 sees that one downtown plant at 9430 has a demand exceeding capacity, thereby resulting in a high (oversize) MS Use Index of 155.

2. RAISE QUESTIONS

- Is the value ratio low?
- Did department run efficiently?
- Can employment mix produce a sufficient design capacity?
- What is the per parcel drain (usage) on the department?

3. ANALYZE THE PROBLEM

- Can you afford the renovation?
- Can the maintenance level be raised? (Is it at 100% already?)
- Is re-districting feasible?
- I employment request at the maximum?
- Can the department afford a higher wage expenditure?
- Is the demand concentrated?
- Does total demand warrant new plant.
- Is redistricting feasible?

4. SOURCES OF REFERENCE	* 72, 74	* 72	* 72	* 72	* 74	* 1, 20, 71	* 1, 20, 71	* 71, 72, 73
5. DEVELOP ALTERNATIVE STRATEGIES	Raise maintenance level		Raise salaries	Request more PLs and/or PMs; request higher appropriations.		Upgrade 9832; Purchase land, build new plant, redistrict to lower demand at 9832		
6. DESIRED RESULT	Increased value ratio which increases effective capacity and lowers use index		Satisfied employment requirement	More workers, which increases design capacity and decreases use index.		Decreased load at plant 9832 which lowers use index		

7. REVIEW & EVALUATE

1. Analyze new output to determine department's overall use index.
2. Isolate remaining problem areas.
3. Check budget.
4. Recycle.

*Numbers refer to list of output sections (appendix F)

2. Director Interaction with the Players' Input Procedure

The director should emphasize the need for players to carefully follow the steps required for a valid input. Two types of errors are most common. The first involves coding errors, such as the improper scaling of numbers. Players should be reminded to double-check their coding forms before submitting them for the EDIT program. The second type usually results from players not making sure that the requirements necessary for the effectuation of certain types of decisions do in fact prevail.

Two appendices are included in this manual to help facilitate players identify the steps they must take. The appendices merely complement the decision-making outline found in the Players' Manual. Appendix A contains thumbnail checklists of the requisite information for each player decision. Appendix B represents a visual approach to explanation of the system's sectors in the form of flow charts. Should the players encounter difficulty in their efforts to complete the basic decisions, the director may illustrate a sample procedure, as presented in either Appendix A or Appendix B.

Besides preparing his own inputs described in the following section, the director should oversee the players' input procedure in order to limit the number of mistakes they make. Appendix C provides an aid to check for proper formatting. The first section of Appendix C describes the general input format, lists all of the possible decisions and notes which decision-making sector has purview over that decision. The second section gives the director a summary of his decisions and the input explanation form for both scales. This section has been modeled after the input explanation chapter of the Players' Manual. Refer to the Players' Manual for instructions on how to use the input decision form.

3. Director Input Decisions

The director has unique decision options available during the players' round. The purpose of the options is to provide the operator with as much flexibility as possible in the game situation. Those options are described below with examples and summarized at the end of this section. The instructor may employ any combination of options.

One. Transfer of Cash TO and FROM the Outside System

In order to correct financial imbalance or to simulate federal grants, etc., the director can transfer cash to an economic decision-maker or to the capital or current account of the Chairman or a department. He uses the regular $CASH routine but his decision-maker identification is ØU (for Outside System).

The following is the correct format:

$CASH/=ØU/C,x,y,PVT,z

where x is the receiver (economic decision-maker or department and jurisdiction)

y is the amount in dollars (no commas or dollar signs)

z refers to the type account into which the amount is going; i.e., PVT if to an economic team; CUR, a department's current account; CAP, a department's capital account.

For example, if the director wants to transfer one million dollars to the Jurisdiction 1 School Department's capital account, he would type:

$CASH/=OU/C,SC1,1000000,PVT,CAP

The director can also use a similar format when transferring money from a decision-maker's account to the outside system:

$CASH/=SC1/C,OU,1000000,CAP,PVT

Such action may be taken to induce serious governmental debts or an economic recession for example.

Two. Float Capital Bonds

Since capital bonds are subject to referenda, they should be floated by the director upon approval by the social sector. The input format for capital bonds is: $OTHER/=department and jurisdiction receiving/BO, amount (in $10,000's),25. For example, if a capital bond of 25 million dollars is approved for the Jursidiction 2 Municipal Services Department, the format would be:

$OTHER/=MS2/BO,2500,25.

All capital bonds have a term of 25 years and the interest rate is determined by the computer.

Three. Price and Salary Changes

The computer program does not allow salaries or prices to be set at less than half of typical or more than one and one half times typical. This limitation can be by-passed by typing certain characters (see Appendix E) after the last legal column of an input decision. For example, if the School Department in Jurisdiction 1 wanted to set salaries for middle income to $9,000 and high income to $15,000, the director could type $OTHER/=SC1/S,90,150,O,A and the decision could be accepted by the input program (EDIT).

Four. Land Bids

If the director wishes, he can control the bids on all parcels of land owned by the computer. He can determine which parcels of land are up for auction and which bidder will get each parcel of land through game administration. In order to guarantee that a player receives a parcel of land, the director uses the following input format:

$PU/=team bidding/location,price (in $1000's)

OU,percent of parcel (0, if all),1.

For example, if economic decision-maker B has bid $150,000 on parcel 7224 and the director wants to guarantee that B receives it, he would type:

$PU/=B/7224,150,OU,0,1

The "1" in the last column tells the computer not to handle the bid in the ordinary manner (as explained in the Players' Manual) but to guarantee it to the decision-maker who is initiating the bid and has input valid data in the first three or four columns.

Five. Create or Remove Public Land (Preempt Land Use).

The director may use the Preempt category to represent any type or mixture of non-usable land that he wants. For example, he can suggest that preempt land represents institutional land holdings (such as federal land, military bases, large land easements, cemeteries, golf courses, country clubs, and non-usable public land) or land that is not usable because of topographical constraints (water bodies, excessive slopes, swamp or marshland, or rock outcroppings). The director can add an amount of preempted land to the local government (representing perhaps a federal land grant) or to the economic sector at a price (representing perhaps the cost of an expensive land fill operation on a piece of swamp property to make it usable for development).

Since the Preempt Land Map will not distinguish the type of preempt category for any particular parcel, it is the responsibility of the game director to record which land is in the various types of uses (i.e., water, airport, federal reservation, etc.). The game operator's ability to start play with any amount of preempt land allows him great influence in the play of the model if he wants to exercise it.

The input format is:

$CVPT/=ØU/PLND,location,percent of parcel to be added to undevelopable.

$CVPT/=ØU/RPLND,location,percent of parcel to be taken out of undevelopable.

For example, the director may decide that he will represent the land taken away from potential local development by creating an airport near the edge of the city, at 8230. He will put 60% of the parcel into preempt use and give the owner, B, $1.5 million for the land.

$CVPT/=ØU/PLND,8230,60

$CASH/=ØU/C,B,1500000,PVT,PVT

If, on the other hand, the director desires to make some preempt land available for purchase and/or development he may make a RPLND (remove preempt land) decision. In this case, the land goes into the holdings of whichever private land owner (an economic team or the outside system) possesses other privately-owned land on that particular parcel. If all land on the parcel was

previously preempt and publicly owned or just preempt, the outside system would become the new owner. The following three cases will illustrate the usage of RPLND.

Case One. Parcel 10020 was a military reservation, entirely in the preempt category. The input:

```
$CVPT/=ØU/RPLND,10220,40
```

makes forty percent of the parcel available for purchase by any government or economic decision-maker by means of a land bid to the outside system.

Case Two. Forty percent of the same parcel is to be bought outright by economic decision-maker B and twenty percent by UT2. Assume that the director has placed the cost at $1,000,000 for 100 percent of the parcel (although not all will be available). The transactions would be completed via the following inputs (there are alternative methods which would also work):

```
$CVPT/=ØU/RPLND,10020,60
$PU/=B/10020,600,ØU,0,1
$PU/=UT2/10020,200,B,20
```

Case Three. Economic team C owns twenty percent of parcel 7630. The remainder (eighty percent) has been preempt but the director decides to allow team C to purchase the remainder for $650,000. The required inputs:

```
$CVPT/=ØU/RPLND,7630,80
$CASH/=C/C,650000,ØU,PVT,PVT
```

Six. Decide to Use a Construction Industry.

If the director decides to incorporate a Construction Industry in the game, players may contract for construction with a local CI, or have an outside firm perform the work at 130% of the typical cost. If local CI's are allowed in the game, a new development begins operation in the round after the decision to build is accepted by the computer. The director may want to simplify construction procedures by having all construction performed by outside firms at 100% of typical cost. In this case, as there are no player-operated CI's on the board, a new development begins operation immediately after the construction decision is submitted and accepted by the computer.

By operating local construction industries the system retains much more revenue in terms of CI income and its subsequent distribution to profits, salaries, goods and services establishments, and taxes, and moreover, boosts employment. On the other hand, players may desire to avoid contending with the relative complexity of this particular economic activity. Furthermore, the local CI situation (YESCI) requires that construction projects take one more round to complete than the NOCI situation, in which completed projects appear the round immediately following the contract input.

The director may want to begin the game without a CI and allow it to be used after the players acquire some familiarity with the model. Or, if the game is to be run with a group for only a few rounds, the director may want to enable players to see the results of their construction decisions sooner than they would if CI were used. In this case, players should use the $OUBLD input for all construction and demolition.

The computer programs operate as though CI's are being used unless the director specifies otherwise. Either decision, once made, is in effect until the director changes it.

The input code to prohibit CI is:

$OTHER/=ØU/NØCI

This decision will not take effect if there is a CI on the board. The director must demolish all CI's with the regular demolition input format, and then input the decision to prohibit CI.

If the director wishes to use a data base which already has CI's and/or has not been specified NØCI, he can perform the necessary demolitions and/or NØCI specifications before running Round 1 output.

After NØCI has been accepted by the computer, the computer will accept no attempts to build CI's. All construction costs will be equal to the typical costs. New development will begin operation in the same round that the construction decision is input.

The input to allow local construction industries is:

$OTHER/=OU/YESCI

For example, the director may choose to show how a natural disaster affects the city. Subsequently, he announces through the media, the destruction caused by the disaster and puts in the actual demolition decisions as though he were the owner of the developments and/or transportation links. Suppose the disaster demolished a section of highway and a level one Light Industry bordering the highway. Assume that the Light Industry owned by economic decision-maker B, is located at 9840, and the highway is an HY2 at 9839 and is in jurisdiction one. Then the required input decisions are:

$OUBLD/=B/9840,LI,1,0

$OUBLD/=HY1/9839,HY2,0

To compensate for the expenditures incurred by these demolitions the director can transfer cash into team B's and the Highway Department's account. (See decision option #1, page 26.)

To emphasize the director may in fact make any player decision, but he should use caution in exercising this option. If the reasons behind his decisions seem unclear and/or illegitimate to the players, they may revolt and institute illegitimate decisions of their own. In order to prevent such player reactions, the director may have to set up a "judiciary" which reviews all decisions to assure that the legal teams made them. Of course, the director could assume responsibility for the review.

Eight. Vary the Number of In-Migrants

The instructor may specify the number of in-migrants, including those due to natural population growth. This decision applies for one round only. For any population class where the instructor has not specified the number of in-migrants, the program will use the in-migration portion to determine the number of in-migrants.

The input format is:

$OTHER/=ØU/class (INHI,INMID, or INLO), number of Pl's to be in-migrants.

For example, during the fourth round the director wishes to force a severe low-income unemployment problem and a shortage of high-income workers. He decides that he will move in 60 PL's and no PH's. He submits the following cards.

```
$OTHER/=ØU/INLO,60
$OTHER/=OU/INHI,0
```

The migration routine determines the in-migration for all classes not specified (in this case, middle). The next round, the instructor does not wish to set the number of in-migrants for any class in any jurisdiction, so he submits no in-migration inputs.

4. Putting in Decisions and Punching Cards

Once the director and players have coded their decisions on the input forms, the decisions must be keypunched onto cards, one decision per card. The director should be aware of several mechanical procedures and card-punching shortcuts.

The two most crucial items of information necessary for each decision are the dollar sign code, (for example, $CASH, $CVPT) which determines the type of decision, and the decision-maker (a government, economic or social sector team or the director). Note that each of these items is preceded by a special character ("$" or "=") and is followed by a slash ("/"). The information before a slash need be repeated only when it changes; i.e., when the decision type ($ code) and/or decision-maker are different from the last accepted code and/or team. Technically, a valid $code followed by a slash always replaces the previous $code; a valid = decision-maker followed by a slash always replaces the previous decision-maker. Thus, once an input decision has been accepted by the EDIT program, the subsequent inputs may require none of the primary information or only one of the two items.

For example, if economic decision-maker A were purchasing parcel 9418 for $120,000 from economic decision-maker C and parcel 9812 for $150,000 from economic decision-maker D, the inputs could be keypunched on the cards as follows:

Card 1: $PU/=A/9418,120,C

Card 2: 9812,150,D

The next example illustrates inputting several economic decisions. B is changing a maintenance level, C is changing a rent, A is changing maintenance levels and a rent and purchasing two parcels as described above:

Card 1: $CVPT/=B/M,10428,95

Card 2: =C/R,8222,145

Card 3: =A/M,10832,97

Card 4: M,9634,92

Card 5: R,7632,160

Card 6: $PU/9418,120,C

Card 7: 9812, 150,D

Each decision should be entered on a separate card to simply present the decisions as well as determine to which error statements the EDIT program refers. Of course, each distinct decision with its complete code may be put on a separate card.

As is noted in the Players' Manual, there are some shortcuts especially applicable to zoning and district boundary changes, where the listing of parcels is valid.

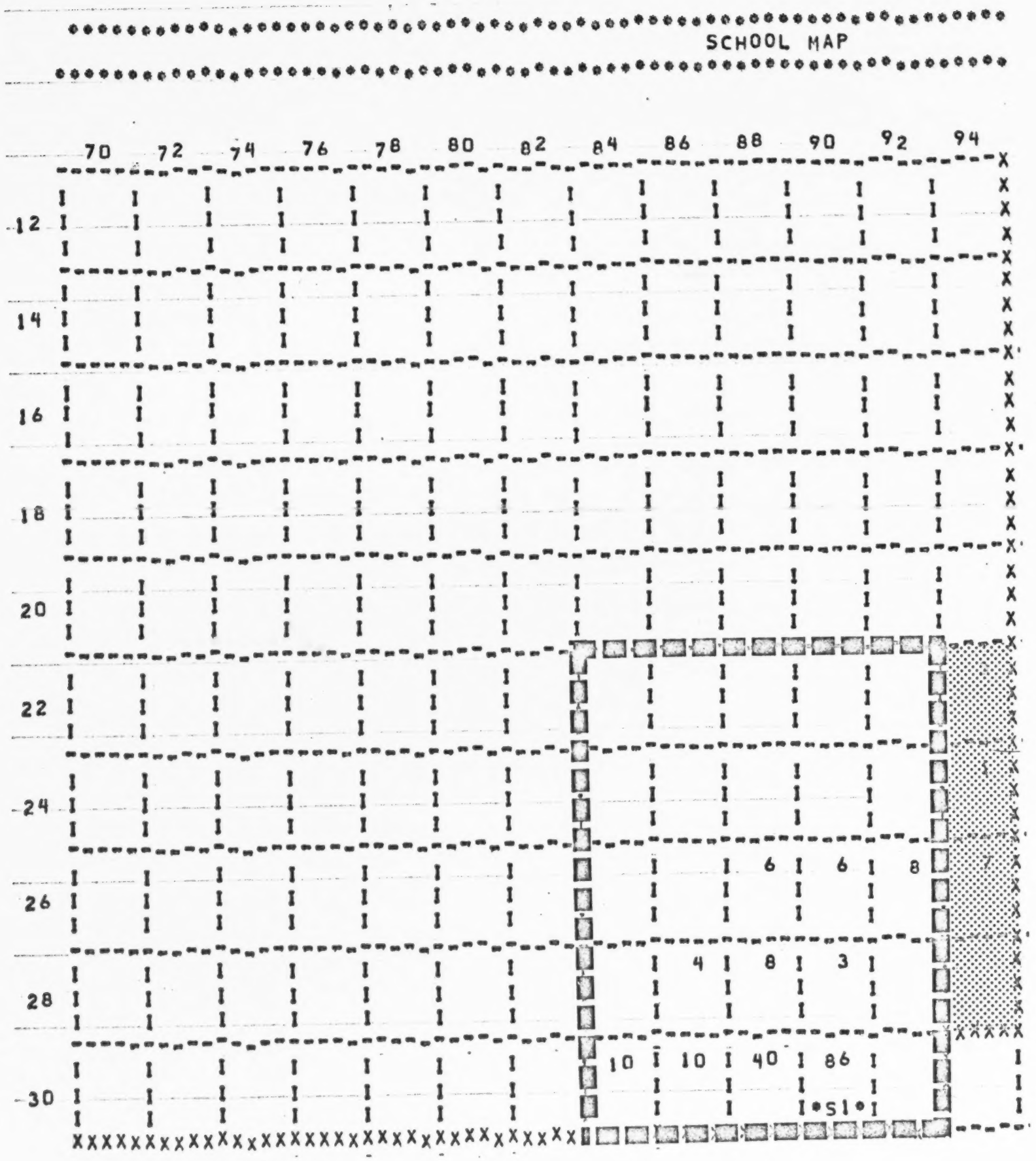
- Any information within parentheses is treated in the same way; e.g., if a player is changing the maintenance level of several developments to 90, he could type (9228, 9830, 7212, 8814) where location is requested. This saves typing an entirely separate input for each location.

- If all of the parcels in a rectangular area are to be treated the same way, the parcels at opposite corners of the rectangle can be designated with a " > " between them where location is requested. For example, the School Department may want to make the outlined area in the figure on the following page a school district for the school at 9030. The location could be specified as (8422 > 9230).

If the line of parcels from 9422 through 9428 were also to be part of the district, the entire input would be:

$REDIST/=SC1/9030,(8422 >9230,9422 >9428)

SCHOOL MAP


70 72 74 76 78 80 82 84 86 88 90 92 94
12
14
16
18
20
22
24
26
28
30
6 6 8
4 8 3
10 10 40 86
1 5 1

In keypunching the inputs, keypunch machines may have different keyboard representations for various special characters. It is important to have the correct holes punched in the card. The first column of the following table gives those holes in the IBM card which must be punched for each special character. Also listed are the keyboard representations of the special characters for two of the widely used keypunch machines. This manual uses the IBM 26 symbols.

Punch Combination	IBM 26 Symbol	IBM 29 Symbol	Function
3-8	=	#	Designate decision-maker
6-8	>	=	Signify block entry
0-4-8	(	%	Start list
12-4-8	)	<	End list

Note: Numbers are "upper case" symbols.

On machines which do not have these symbols, the characters may be keypunched by first depressing the "multipunch" key and then, keeping that depressed, punching the number constituting the combination. Thus to start a list depress the multipunch key and then punch "0" "4" and "8."

Once the director and player input decisions have been punched onto cards, the director must sequentially order the cards. Properly sequencing the cards is important because the data files (team cash balances, ownership, zone, etc.) are updated in the order that the inputs are processed. For example, a decision-maker could buy land, change that parcel's zoning, have utility service installed on that parcel, borrow the funds for construction, and then build on the parcel all during the same round of decision-making. He could do all that only if the inputs required to accomplish all the tasks were ordered in such a way that the build decision was last, as is the case in the enclosed suggested sequence. While the director may deviate from any prescribed order, the following sequence for inputs is recommended for maximum decision-making success.

1. $CASH... all cash transfers, appropriations and subsidies
2. $OTHER/=dm/BO or LO... borrow or loan
3. $PU... all land purchases and bids
4. $TAXES... tax rates
5. $ASMNT... assessment decisions
6. $FSA... all requests for federal-state aid
7. $CVPT/=PZ/Z... zoning changes
8. $OUBLD/=UT/... build utility plant
9. $VVPT/=UT/US... change utility service
10. $OTHER/=UT/P... change utility prices
11. $BUILD... all construction projects
12. $OUBLD... all outside construction projects except for utility plants
13. $CVPT/=MS or SC/E... change employment for municipal services or schools
14. $CVPT/=MS or SC/M... change maintenance level for municipal services or schools
15. $REDIST/=MS or SC... change district boundaries
16. $OTHER/=MS or SC/S... change salaries
17. $RAIL... build rail lines or stations
18. $ROUT/=BUS or RAIL... change routes or level of service
19. $OTHER/=BUS or RAIL/PS,SS,P,S, or M... purchase rolling stock, sell rolling stock, set fares, change salaries or change maintenance level
20. $OTHER/=HY/M... change highway maintenance

**21. $CVPT/=edm/R,P,S or M... change rents, prices, salaries or maintenance level

**22. $OTHER/=edm/SP,CN,SELL SP,SELL CN... buy or sell speculative or conservative stocks

23. $TIME... allocate time by class and/or parcel
24. $BYCT... boycott working, shopping or using public transit
25. $VALUE... change the dollar value of time

* dm refers to either government or economic decision-makers
** edm refers to economic decision-makers

Finally,listed below are assorted notes on player input procedures.

a. Requeests for federal-state aid for road construction must contain the location in parentheses. The location of the intersections at either end of a straight-line section must be given. If the road turns, the intersections at both ends of each straight-line section must be listed.

b. Requests for capital federal-state aid should be processed one round before a department attempts to build something or in the case of PZ, purchase land with the money.

c. Since installations of utility service must be "connectable," they must be fed to the computer in order.

Ordering the input cards is the final step before submission of the inputs to the computer. The program EDIT accepts correct decisions and makes the player and director specified changes to the data base. EDIT also rejects incorrect decisions and prints diagnostic messages below each rejected decision to indicate the source of the error. This output from the EDIT program is discussed thoroughly in Appendix D. Appendix C reiterates the mechanics involved in preparing player inputs. Both appendices are necessary supplements to this section of the manual.

APPENDIX A

PLAYER THUMBNAIL DECISION CHECKLISTS BY SECTOR: ECONOMIC, SOCIAL, GOVERNMENT

ECONOMIC SECTOR THUMBNAIL
DECISION CHECKLIST

DECISION	PLAYER CHOICES	CHECKPOINTS
BUILD OR UPGRADE RESIDENCES	Location Type (C; B; or A) Level (1 to 8) QI (40, 50, 60, 70, 80, 90, 100) ML (0 to 100) Rent/Space Unit	Land availability (12% required/level) Construction costs Cash balance Zoning Level of Utility Service Road access
BUILD OR UPGRADE BASIC INDUSTRY	Location Type (HI; LI; NS) Level (1 to 3) ML (0 to 100) Salaries	Land availability Construction costs Cash balance Zoning (20, 21; 20, 22; 30, 31) Level of Utility Service Road access Proximity to residential units
BUILD OR UPGRADE COMMERCIAL	Location Type (BG: BS: PG; PS) Level (1 to 3) ML (0 to 100) Price/Cu Salaries	Land availability Construction costs Cash balance Zoning (30, 32; 33; 34; 35) Level of Utility Service Road access Terminal access (for BG only) Market potential Proximity to residential units
BUILD OR UPGRADE CONSTRUCTION INDUSTRY	Location Level (1 to 3) ML (0 to 100) Salaries	"YESCI" Option that cash balance exceeds $120,000,000 Zoning (20 or 23) Land availability (20%/level) Proximity to residential units

DECISION	PLAYER CHOICES	CHECKPOINTS
MAINTAIN RESIDENTIAL UNIT	Location Maintenance Level (0 - 100) 20 points greater than above the lowest QI ever reached	Renovation Costs or Savings What class wanted as residents
MAINTAIN COMMERCIAL, CONSTRUCTION INDUSTRY AND BASIC INDUSTRY	Location Maintenance Level (0 - 100)	Renovation costs or savings Desired capacity
PURCHASE LAND PROPERTY	Location Seller Amount ($)	If bid, market value Cash balance Potential of property
BORROW	Source Term Amount	Interest rate Credit rating Rate of return
CHANGE RENTS	Location Amount	Trade off: e.g., high rents will only increase income if residents stay. System-wide vacancy rate Unemployment rate MS Use Index School Use Index
CHANGE PRICES	Location Amount	Competition Percent over/under capacity Income trade-off
CHANGE WAGES	Location Amount	Unemployment rate New Employers profitability Proximity to residential units

DECISION	PLAYER CHOICES	CHECKPOINTS
INVEST	Type (speculative or conservative)	Business Cycle
	Amount	Cash Balance
		Opportunity Cost

SOCIAL SECTOR THUMBNAIL

DECISION CHECKLIST

DECISION	PLAYER CHOICES	CHECKPOINTS
TIME ALLOCATION	Class Jurisdiction Parcel	Trade offs between each of the following:
For Extra Work	Amount	Savings Relative education level Supply of jobs
For Public Adult Education	Amount (only for PM and/or PL)	Employment status Education level Supply of teachers
For Private Adult Education	Amount	Savings Future income gain Cost Education level
For Politics	Amount	Registered voters Potential political influence
For Recreation	Amount	Cost Dissatisfaction level
VOTE	Candidate Referendum	Issues Platform Record
BOYCOTT	Location Class Type (shop, work, use) Stop/Begin	Potential effect Additional support Alternatives
SET TIME DOLLAR VALUE	Amount (0 to 100) Class	Modal preference Savings

GOVERNMENT SECTOR THUMBNAIL
DECISION CHECKLISTS

CHAIRMAN by Jurisdiction

DECISION	PLAYER CHOICES	CHECKPOINTS
SET LOCAL TAXES	Among Alternatives below	Revenue needs Trade offs Assessments Forecasted bases Rates of neighboring jurisdiction(s)
LAND, IMPROVEMENT	Rate (0.0 to 9.9) Type (Land or Development)	Impact on Economic Sector Desired share of total revenue
PERSONAL INCOME AND AUTOMOBILE	Rate (0.0 to 9.9) Type (RI, EI, RA, EA)	Effect on migration Effect on voters Effect on commuters
SALES	Rate (0.0 to 9.9) Type (G or S)	Profitability and type of establishments Effect on migration Desired share of total revenue
GRANT APPROPRIATIONS	Department (MS, HY, (SC, PZ) Account Amount	Needs Resources - alternatives Revenues
GRANT SUBSIDIES	Department (UT, (BUS, RAIL) or Economic Team Amount Account	Needs Resources - alternatives Revenues Future benefits
SET WELFARE RATE	Amount	Unemployment rate Revenues Effect on migration Effect on voters Needs of Population

DECISION	PLAYER CHOICES	CHECKPOINTS
DEMOLISH SCHOOL	Level Employment Request Location	Trade off between renovation Demand Resources Impact on voters
PROVIDE ADULT EDUCATION	Amount	Cash balance (current) Effect on system: Distribution of income Effect on education levels Impact on voters
CONTRACT	Type Location Owner Percent Priority	Price Owner good will

MUNICIPAL SERVICES by Jurisdiction

DECISION	PLAYER CHOICES	CHECKPOINTS
PURCHASE	Location Seller Amount of land Amount of $	Market value Cash balance (capital) Property potential
CHANGE EMPLOYMENT MAINTENANCE LEVEL	Location Amount (PL-PM; 0 to 100)	Effect on capacity Budget restrictions Effect on PL unemployment
REDISTRICT	Location of plant Location of district	Demand (load) by parcel Capacity of plant Continuity of districts
CHANGE WAGES	Amount	Unemployment rate New employers Migration effect Budget restrictions

ASSESSMENT by Jurisdiction

DECISION	PLAYER CHOICES	CHECKPOINTS
ASSESSMENT	Type (juris-wide, SZ,SA) Locations Rate (0.0 to 100.0)	Property rates Desired tax base Economic status Cost and/or benefits of preferential treatment Political impact

SCHOOL by Jurisdiction

DECISION	PLAYER CHOICES	CHECKPOINTS
PURCHASE LAND	Location Seller Amount of Land Amount of Dollars	Market value Cash balance (capital) Property potential
CHANGE EMPLOYMENT MAINTENANCE LEVEL	Location Amount (PM-PH or 0 to 100)	Effect on school capacity Effect on PM, PH students Budget restrictions
REDISTRICT	Location of school Location of district	Number and class of students School capacity and measures Continuity of all districts
CHANGE WAGES	Amount	Unemployment Rate New Employers Migration effect Budget restrictions
CONSTRUCT NEW SCHOOL	Level Maintenance Level Location Employment request	Demand Resources (including abailability of FSA) Impact on voters Land availability

DECISION	PLAYER CHOICES	CHECKPOINTS
CONSTRUCT NEW PLANT	Level Maintenance level Location Employment request	Land availability Potential demand Resources Impact on voters
CONTRACT	Type Location Owner Percent Priority	Price Owner good will

HIGHWAY by Jurisdiction

DECISION	PLAYER CHOICES	CHECKPOINTS
PURCHASE	Location Seller Amount of land Amount of Dollars	Cost (market value) Cash balance (capital) Property usefulness
CHANGE MAINTENANCE LEVEL	Type (1, 2, or 3) Level (0 to 100)	Cost (possible trade off to upgrade) Usage
BUILD OR UPGRADE HIGHWAYS	Level Location	Cash balance (capital) Actual and potential usage Costs of rights-of-way Construction costs Revenue sources Effect on voters Jurisdiction boundary
BUILD OR UPGRADE TERMINALS	Level Location	Cash balance (capital) Potential sites Potential demand Current usage Jurisdiction boundary

DECISION	PLAYER CHOICES	CHECKPOINTS
APPLY FOR FSA	Level Location	Time Lag Probability of grant

PLANNING AND ZONING by Jurisdiction

DECISION	PLAYER CHOICES	CHECKPOINTS
PURCHASE LAND	Location Seller Amount of land Amount of dollars	Population location and density Desired greenbelt areas Master plan Cash balance (capital)
ZONE	Location(s) Zone	Master plan Desired land use Political impact
CHANGE PUBLIC INSTITUTIONAL LAND	Location Amount	Location and amount of PZ undeveloped land Cash balance (capital Intended use

UTILITY by Jurisdiction

DECISION	PLAYER CHOICES	CHECKPOINTS
PURCHASE LAND	Location Seller Amount of land Amount of dollars	Market value Cash balance (capital) Property potential Locations of area of service (actual and potential)
PROVIDE SERVICE	Location of plant Location of parcel(s) requiring new service	Cash balance (capital) Location of plant districts Effect of new usage on plant operating costs Capacity of installation and service
PRICE	Amount	Cash balance (current) Operating costs (projected) Political impact

DECISION	PLAYER CHOICES	CHECKPOINTS
CONSTRUCT NEW PLANT	Location New level	Land availability Cash balance (capital) Area of service (potential and actual)

BUS

DECISION	PLAYER CHOICES	CHECKPOINTS
CAPITAL STOCK ADJUSTMENTS	Purchase (PS) or Sell (SS) Amount	Miles of service Needed capacity for all lines Cash balance (capital)
CHANGE SALARY	Amount to PM workers	Unemployment rate Competitiveness of labor market Average wage to PM's
CHANGE MAINTE-NANCE LEVEL	Amount	Cash balance (current) Needed capacity for all service Units owned
CHANGE PRICE	Base fare Per mile fare	Social time dollar value Congestion Cash balance (current)
CHANGE ROUTE(S)	Route number Desired level of service Exact route (home to work)	Highway locations Traffic patterns Capacity of route(s) Total serviceable units

RAIL

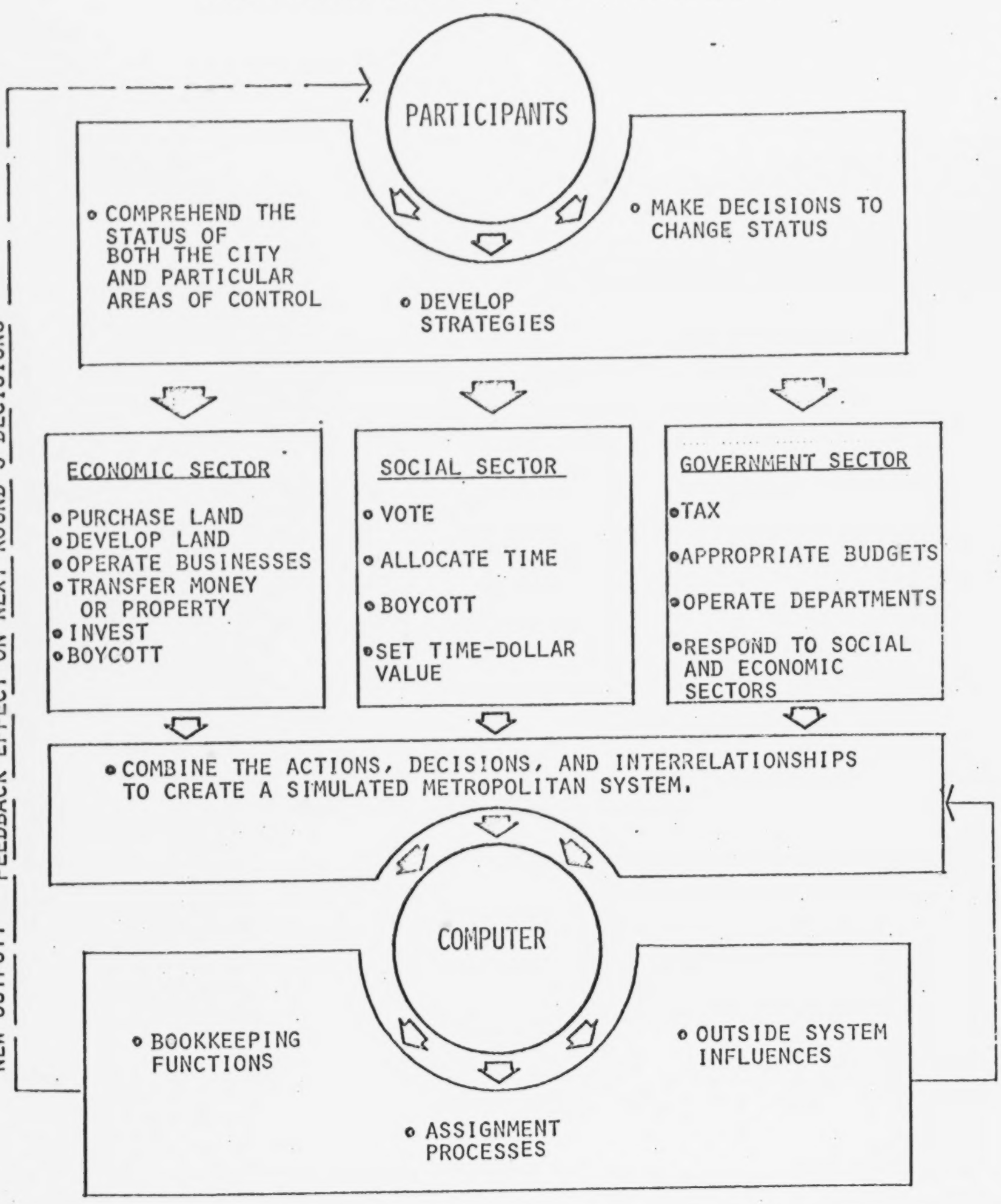
DECISION	PLAYER CHOICES	CHECKPOINTS
CAPITAL STOCK ADJUSTMENTS	Purchase (PS) or Sell (SS Amount	Miles of service Demand for stock Needed capacity for all lines Cash balance (capital)
CHANGE PRICE	Base fare Per mile fare	Social time dollar value Capacity/congestion Cash balance (current)
CHANGE SALARY	Amount to PM worker	Unemployment rate Competitiveness of labor market Average wage to PM's
CHANGE MAINTE-NANCE LEVEL	Amount	Cash balance (current) Needed capacity for all lines Units owned
PURCHASE LAND	Location Seller Amount of dollars	Market value Contiguity with proposed track Cash balance (capital)
CONSTRUCT TRACKS AND STATIONS	Location(s) Parcels over which track is built	Cash balance (capital) Proposed routing Inducement to usage build up Stations coincident with tracks and road bed intersections
CHANGE ROUTE(S)	Route number Desired level Exact route (home to work)	Track and station locations Population density Traffic patterns Capacity

APPENDIX B

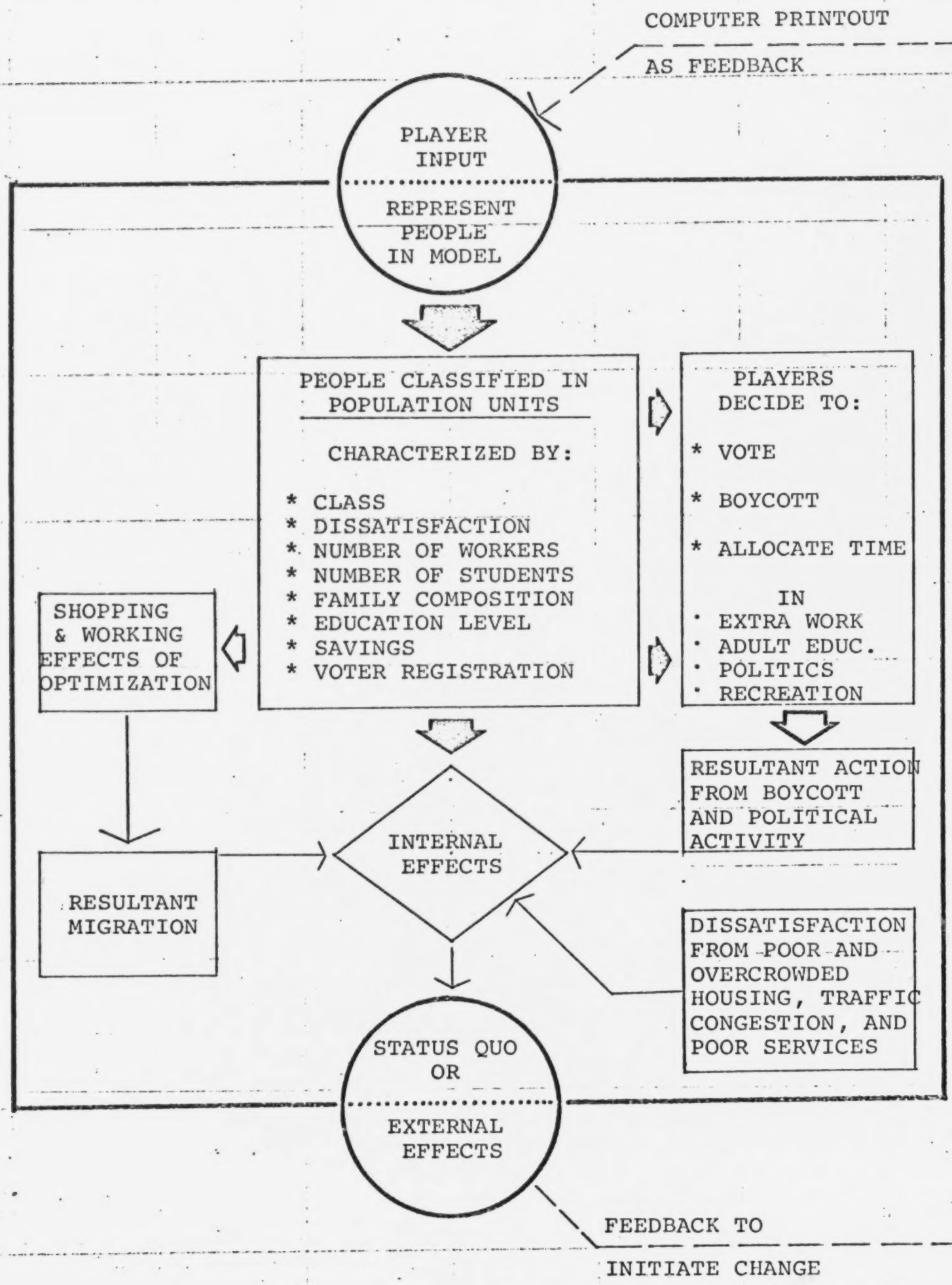
FLOW DIAGRAMS:

INTERRELATIONSHIPS IN THE CITY III MODEL
SOCIAL SECTOR
ECONOMIC SECTOR
GOVERNMENT SECTOR

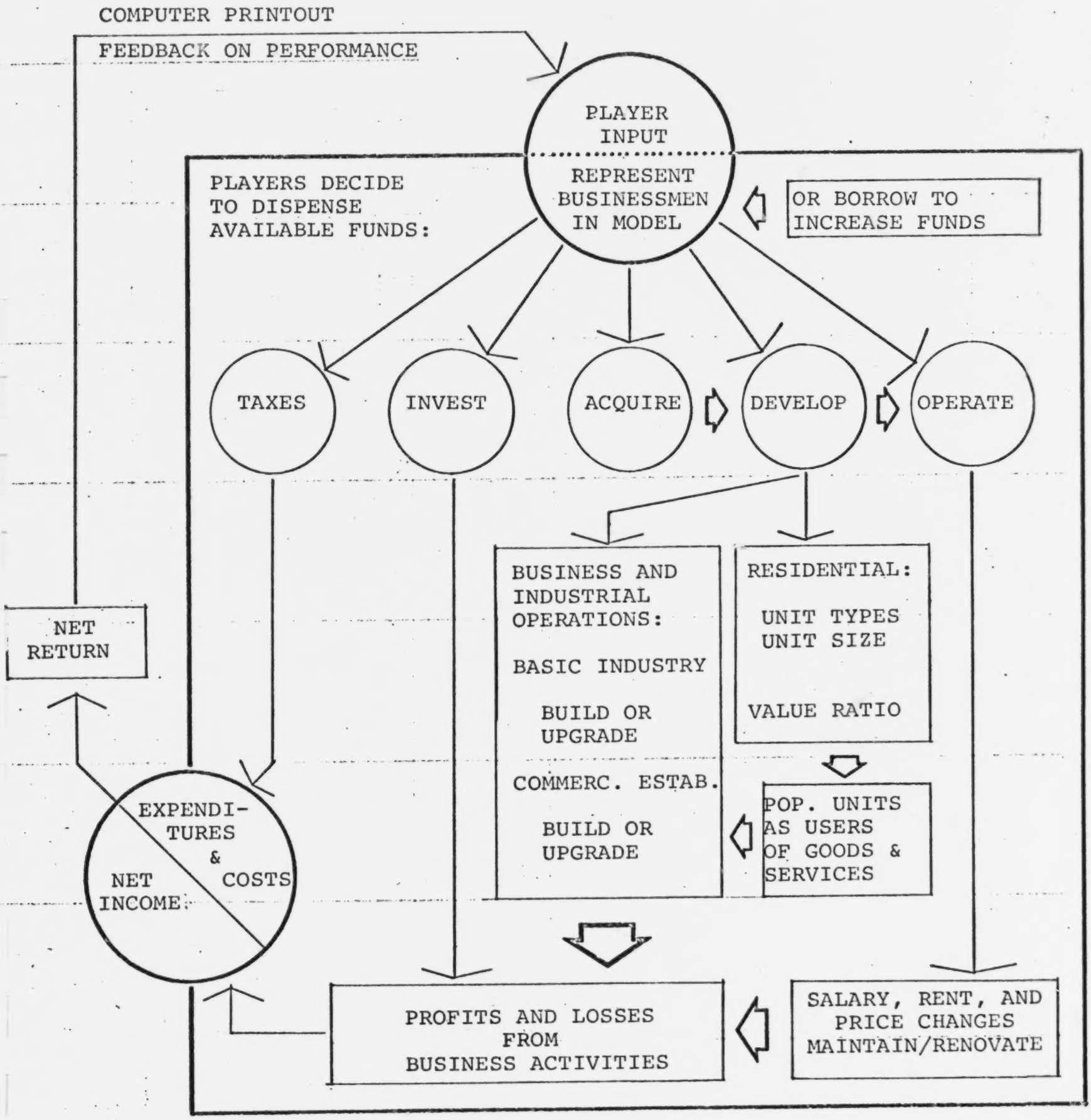
INTERRELATIONSHIPS IN THE CITY III MODEL



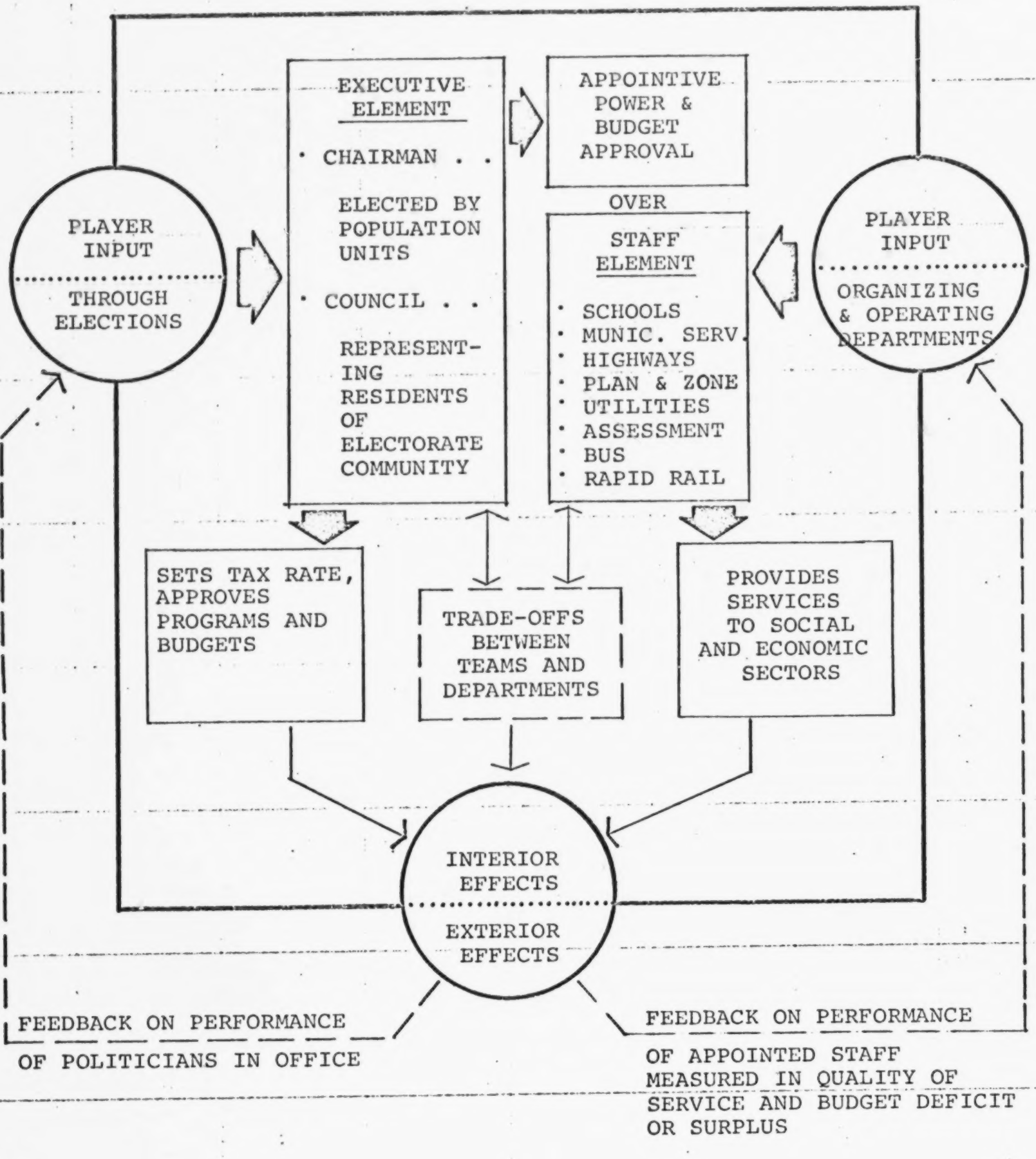
SOCIAL SECTOR



ECONOMIC SECTOR



GOVERNMENT SECTOR



APPENDIX C

INPUTTING DECISIONS IN THE

CITY III MODEL

In order to input a decision in the City III Model, players or the director must keypunch an input card with a decision message in the following form:

$CODE/=DM/a,b,c,d,.....

1. The first item of information in the line ($CODE) is one of 15 general decision codes. This code tells the general type of decision being made. In City III a dollar sign ($) is the first symbol in all general decision codes. The general decision codes are:

		Govt.	Soc.	Econ.	Dir.
a.	$PU	x		x	
b.	$CVPT	x		x	x
c.	$OTHER	x		x	x
d.	$OUBLD	x		x	
e.	$BUILD	x		x	
f.	$CASH	x		x	x
g.	$TIME		x		
h.	$BYCT		x	x	
i.	$VALUE	x	x		
j.	$TAXES	x			
k.	$ASMNT	x			
l.	$REDIST	x			
m.	$FSA	x			
n.	$ROUT	x			
o.	$RAIL	x			

2. A slash sign (/) always follows the decision code.

3. The second item of information for a decision is the identification of the decision-maker. An equal sign (=) is used to preface the decision-maker identification code. The decision-maker codes are:

A . . . Economic -- number of teams

AA . . Social -- number of teams

CH1 . . Chairman -- number of jurisdictions
AS1 . . Assessment -- number of jurisdictions
SC1 . . School -- number of jurisdictions
MS1 . . Municipal Services -- number of jurisdictions
PZ1 . . Planning and Zoning -- number of jurisdictions
UT1 . . Utility -- number of jurisdictions
HY1 . . Highway -- number of jurisdictions
BUS . . Bus Company
RAIL . Rapid Rail Company

OU . . Outside -- Used by the game director

4. The decision-maker code is followed by a slash mark (/).

5. The remaining information concerning the decision is printed after the second slash and is separated by commas. The blank spaces are ignored in the decision-information. For example, the following information is identical to the computer:

$CVPT/ =A / S, 72 40 , 26 , 51 , 102

$CVPT/=A/S,7240,26,51,102

The information following the second slash varies by the type of decision. For the following explanations assume the format:

$CODE/=DM/a,b,c,d, etc.

here "a" is the first item of information after the second slash, "b" is the second item of information, etc.

The general decision codes that can be used to make more than one type of specific decision require that a specific decision code be placed in the "a" space. The general and specific codes are summarized below:

	General Code and Meaning	Specific Code and Meaning
1.	$PU purchase land and/ or developments	None
2.	$CVPT change existing conditions on location-specific items	R - change rents P - change prices S - change business salaries M - change maintenance level of public and private developments E - change employment at a school or municipal service location C - award contracts to BG and BS by school or municipal service department. US - change or add utility service to a parcel of land Z - change zoning on a parcel PLND - add preempt land RPLND - replace preempt land
3.	$OTHER change conditions for non-location-specific items	LO - take a loan from another team (only the borrower) BO - take a loan from the outside by a private team or a government department SP - invest insspeculative stocks SELLSP - sell speculative stocks CN - invest in conservative stocks SELLCN - sell conservative stocks W - set the welfare payment per unemployed worker S - change salaries for SC, MS, BUS or RAIL department jurisdiction-wide M - change maintenance level of a highway type for an entire jurisdiction or of bus or rail equipment.

		P - change the price of utility service for a jurisdiction or fare for bus or rail
		PS - purchase bus or rail rolling stock
		SS - sell bus or rail rolling stock
		NOCI - play without a local CI
		YESCI - play with local CI
		INLO - move in a specified number of PL's via the migration routine
		INMID - move in a specified number of PM's via the migration routine
		INHI - move in a specified number of PH's via the migration routine
4.	$OUBLD have an outside construction firm build a private or public development	None
5.	$BUILD have a local construction firm build a private or public development	None
6.	$CASH transfer cash from one account to another	C - transfer of cash from other than the chairman's account CP - appropriate capital funds CR - appropriate current funds CURS - grant a current subsidy CAPS - grant a capital subsidy SB - grant a subsidy to an economic team
7.	$TIME allocate the leisure time for population units	H - for high income class M - for middle income class L - for low income class

8.	$BYCT boycott working, shopping, or using public transit	S - social boycott (by population units) E - economic boycott (by businesses)
9.	$VALUE change the dollar value of time for population units	H - for high income class M - for middle income class L - for low income class
10.	$TAXES change tax rates for various bases	L - assessed value of land D - assessed value of developments RI - income earned by residents of the jurisdiction EI - income earned by those employed within the jurisdiction RA - auto expenses of residents of the jurisdiction EA - auto expenses of those employed within the jurisdiction G - total value of BG and PG sold by stores in that jurisdiction S - total value of BS and PS sold by stores in that jurisdiction
11.	$ASMNT make changes by the assessment department	D - development assessment rate jurisdiction-wide or by zone for all developments or by type L - land assessment rate jurisdiction wide or by zone for land occupied by all developments or by type of development SZ - define a special assessment zone SA - make special assessments for land or developments
12.	$REDIST change district boundaries for SC or MS	none
13.	$FSA request federal-state aid by department	none

14.	$ROUT change levels of service and routes for bus and rail operation	none
15.	$RAIL build rail lines and rail stations	none

CITY III

DIRECTOR'S SUMMARY INPUT EXPLANATION FORM (normal scale)

Type of Decision	Code	Decision Maker	a	b	c	d	e	f
Transfer Cash	$CASH	OU or economic decision-maker or department and jurisdiction	C	receiver (economic decision-maker or OU or department and jurisdiction)	amount in dollars	giver's account (PVT or if department CAP or CUR)	receiver's account (PVT or if department CAP or CUR)	
Float Capital Bonds	$OTHER	department receiving	BO	amount in $10,000's	25			
Economic Price Change (Outside input limits check)	$CVPT	economic decision-maker	P	location	basic price per CU in $100's	0	0	A if new price is to be accepted
Economic Salary Change (Outside input limits check)	$CVPT	economic decision-maker	S	location	salary per low-income worker in $100's	salary per middle-income worker in $100's	salary per iigh income worker in $100's	A if new salaries are to be accepted

Type of Decision	Code	Decision Maker	a	b	c	d	e	f
Utility Price Change (Outside input limits check)	$OTHER	UT1, UT2 or UT3	P	new price per unit of utility service	1 if new price is to be accepted			
Change School Salaries (Outside input limits check)	$OTHER	SC1, SC2 or SC3	S	salary per middle income worker in $100's	salary per high income worker in $100's	0	A if new salary is to be accepted.	
Change MS salaries (Outside input limits check)	$OTHER	MS1, MS2 or MS3	S	salary per low-income worker in $100's	salary per middle income worker in $100's	0	A if new salary is to be accepted.	
Assure Land Purchase	$PU	Decision-maker bidding	location	price in $1000's	OU	percent of parcel (0 if all)	1 to insure bid success	
Create Preempt Land	$CVPT	OU	PIND	location	percent of parcel to be added to undevelopable			

Type of Decision	Code	Decision Maker	a	b	c	d	e	f
Remove Preempt Land	$CVPT	OU	RPLND	location	percent of parcel to be taken out of undevelopable			
Forbid Construction Industry	$OTHER	OU	NOCI					
Allow Construction Industry	$OTHER	OU	YESCI					
Specify Number of In-Migrants	$OTHER	OU	INLO, INMID, INHI		number of Pl's to in-migrate			

CITY III

DIRECTOR'S SUMMARY INPUT EXPLANATION FORM (small scale)

Type of Decision	Code	Decision Maker	a	b	c	d	e	f
Transfer Cash	$CASH	OU or economic decision maker	C	receiver (economic decision-maker or OU or department and jurisdiction)	amount in dollars	giver's account (PVT or if department CAP or CUR)	receiver's account (PVT or if department CAP or CUR)	
Float Capital Bonds	$OTHER	department receiving	BO	amount in $1,000's	25			
Economic Price Change (Outside input limits check)	$CVPT	economic decision maker	P	location	basic price per CU in $10's	0	0	A if new price is to be accepted
Economic Salary Change (outside input limits check)	$CVPT	economic decision maker	S	location	salary per low-income worker in $100's	salary per middle-income worker in $100's	salary per high-income worker in $100's	A , if new salaries are to be accepted

Type of Decision	Code	Decision Maker	a	b	c	d	e	f
Utility Price Change (Outside input limits check)	$OTHER	UT1, UT2 or UT3	P	new price per unit of utility service	1 if new price is to be accepted			
Change School salaries (outside input limits check)	$OTHER	SC1, SC2, or SC3	S	salary per middle income worker in $100's	salary per high income worker in $100's			
Change MS salaries (outside input limits check)	$OTHER	MS1, MS2, or MS3	S	salary per low-income worker in $100's	salary per middle income worker in $100's			
Assure Land Purchase	$PU	decision-maker bidding	location	price in $100's	OU	percent of parcel (0 if all)	1 to assure bid success	
Create Preempt Land	$CVPT	OU	PLND	location	percent of parcel to be added to undevelopable			
Remove Preempt Land	$CVPT	OU	RPLND	location	percent of parcel to be taken out of undevelopable			

Type of Decision	Code	Decision Maker	a	b	c	d	e	f
Forbid Construction Industry	$OTHER	OU	NOCI					
Allow Construction Industry	$OTHER	OU	YESCI					
Specify In-Migrants	$OTHER	OU	- class and jurisdiction INLO, INMID, or INHI	number Pl's to in-migrate				

APPENDIX D

EDITS

The listing of the director and player input decisions and the EDIT Program generated diagnostics of the decisions comprise what is called the edits. This appendix contains an explanation of all the messages which could appear in the edits. Familiarity with this appendix will enable the director to suggest the reasons for decision rejections.

If and only if an input decision is in error will an error message be generated. The absence of any message (except in the cases of federal-state aid requests, auctions, redistricting and bonding) indicates that the decision has been accepted and its changes incorporated into the data base. The edits are listed in the same order as they are inputted. Additional diagnostics concerning bids on parcels up for auction, federal-state aid requests, and school and municipal services redistricting attempts[1] are printed as the final part of the edits.

The description of edits will be presented in the following order:

A. General Error Messages (for inputs that have been rejected because of formatting errors or because of improper team, location, or land use identification).

B. $BUILD and $OUBLD Error Messages (for inputs that relate to local and outside construction of private and public land uses).

C. $CASH Error Messages (for inputs to transfer funds, make appropriations, and grant subsidies)

D. $PU (Purchase) Error Messages (for inputs to bid on auctioned or other outside-owned land or to acquire property from another team).

E. $OTHER and $CVPT Error Messages (for inputs to change conditions that are non-location specific and location specific).

F. $TAXES Error Messages (for inputs to change tax rates applied to various tax bases).

1] These inputs are collected and processed as the final action of the EDIT program.

G. $FSA Error Messages (for inputs to request Federal-state aid for capital expenditures by department).

H. $REDIST Error Messages (for inputs to create and change boundaries for SC or MS districts).

I. $RAIL Error Messages (for inputs to build rail lines and rail stations)

J. $ROUT Error Messages (for inputs to change service levels and routes for the Bus and Rail Departments).

K. $TIME Error Messages (for inputs to change the time allocation for population units by class and/or parcel).

L. $BYCT Error Messages (for inputs to make economic or social boycotts)

M. $VALUE Error Messages (for inputs to change the dollar value of time units spent travelling).

N. $ASMNT Error Messages (for inputs to change assessment rates and to establish new assessed values).

O. Following End of Input Data (remarks on land auction, redistricting, and Federal-state aid requests).

A. General Error Messages

For all general errors, an indicator (Δ) points to the approximate location of the error.

1. INVALID $ ENTRY

Incorrect general decision code. All subsequent decisions using this $ entry will be invalidated.

2. INVALID TEAM ENTRY

Mistake in the team identification in the decision-maker location of the input card. Might be caused by omitting second slash or mispunching "=".

3. NO CURRENT VALID $ ENTRY

No valid general decision code has been entered or the last one entered is in error. Usually will occur after a #1 error.

4. NO CURRENT VALID TEAM ENTRY

No valid team identification has been entered in the decision-maker location of the input card or the last one entered is in error.

5. NO RIGHT PARENTHESIS

In the right hand parenthesis for an input requiring one has been omitted. All lists, and only lists, must be enclosed in parentheses.

6. INVALID LOCATIONS LIST

Mixing of parcel (even-even), intersection (odd-odd) and road locations (even-odd or odd-even) on the same list.

7. INCORRECT PUNCTUATION

Indicator points to incorrect punctuation. Examples: comma (,), slash (/), etc.

2] 8. INVALID LAND USE

Use of the wrong abbreviation for the land uses in the model.

2] 9. INVALID TEAM

Mistake on the specification of a team identification elsewhere in the decision-maker location on the line.

10. MORE THAN 15 CHARACTERS

Might result if commas were omitted from the input card.

11. NUMBER TOO HIGH

Too large of a number has been input. Check input explanation form to see if scaling has been observed.

12. NUMBER TOO HIGH OR TOO LOW

The entered number is not within the prescribed limits of this particular entry. Normally, a fifty percent variation around typical values is permitted.

2] 13. INVALID CHARACTER IN NUMBER

An extraneous character has been added to a number This could be a dollar sign for a land bid or price. Note that all figures are coded without commas.

14. LIST NOT PERMITTED

Parentheses have been used to include several entries where only one entry is allowed. Be careful on $RAIL and $ASMNT decisions.

15. INCORRECT LOCATION ENTRY

Not a valid location on the board or use of a parcel, road, or intersection for that type of decision.

2] Errors in number 8, 9, 13 and 15 often occur when data is coded in the improper column. The EDIT Program expects certain designations (team letter, land use code, etc.) in specific places. When an input has the columns wrong, errors 8, 9, 13 or 15 will occur.

16. BLOCK ENTRY NOT PERMITTED

Opposite corners used to specify a zone when a zone is not permitted. Another way to put it is that in this list the character " > " is invalid.

17. INVALID ROAD COORDINATES

Will only accept even-odd or odd-even combinations that are on the board.

18. MORE THAN 65 LOCATIONS IN LIST

Input of a zone or district in a total line entry that is too large, i.e., exceeds 65 locations.

19. MORE THAN 15 ENTRIES IN NONLIST

This message indicates a program error. Please notify Envirometrics about this error.

B. $BUILD and $OUBLD Error Messages

1. LEVEL ERROR

Old and new levels are the same or the new level is too high.

2. (team name) CANT BUILD LAND USE

Some sort of build that is not allowed by government or economic team.

3. QI (quality index) ERROR

A quality index less than 40 or more than 100.

4. ONLY RA'S CAN HAVE PRIVATE UTILITIES

If private utilities are attempted for a build of RB or RC housing, the build will be rejected.

5. WRONG ROUTINE

Use of RAIL as a decision-maker or contractee on a build decision code. (Rails are built using $RAIL) or use of $BUILD to construct a utility plant.

6. LOCATION ERROR

Trying to build something like a road on a parcel or intersection on a road, or a terminal on a parcel or along a road.

7. COST TO (team name) FOR BUILD ON (location) IS $ (price) ONLY HAS $ (capital balance)

Rejects build for teams with insufficient funds.

8. (team name) OWNS (location)

When wrong owner of the location has been specified.

9. (number) % OF (location) IS REQUIRED, - ONLY (number) % IS AVAILABLE

Not enough land is available for that type of construction.

10. (land use) AT (location) IS LEVEL (number)

Old level has been incorrectly specified.

11. (location) IS ZONED (number) WHICH PROHIBITS (land use)

Indicates zoning conflict.

12. NO (land use) ON (location)

Try to upgrade or demolish something that is not there.

13. REQUIRES LEVEL (number) UTILITY SERVICE - ONLY HAS LEVEL (number)

Inadequate utility service.

14. EXCEEDS UTILITY PLANT CAPACITY

Maximum of 8191 units per level of utility plant can be consumed.

15. REALLOCATION OF SERVICE MUST PRECEDE DEMOLITION

If a utility plant is reduced to zero, all assigned service must be first reallocated.

16. UNITS CONSUMED MUST BE DECREASED TO (number) BEFORE DEMOLITION

To reduce level or levels of a utility plant the number of units served by the plant must be:

a. Less than or equal to 4800 if the reduction is to a UT2.

b. Less than or equal to 2400 if the reduction is to a UT1

17. (UT or CI) ONLY BUILT OUTSIDE

Neither utility plants nor construction industries can be built by local firms, i.e., $BUILD is an invalid decision code for these two land uses.

18. THERE IS NO JURISDICTION (number)

An incorrect number has been placed in the jurisdiction field.

19. (location) IS NOT A CI IT IS A (land use)

When location specified for the CI does not actually have a CI on it; this mistake most often occurs when the location of parcel intended for construction is specified in column A.

20. (team name) OWNS CI AT (location)

Wrong owner of the CI has been specified. Recall the decision-maker for a $BUILD input is the owner of the CI (contractor).

21. (location) IS IN JURISDICTION (number)

Government department tries to build in wrong jurisdiction or Highway Department did not specify other jurisdiction involved in a road along a boundary.

22. JURISDICTION (number) IS RESPONSIBLE FOR (highway location) - upgrading a highway along boundary by jurisdiction other than the jurisdiction that built the highway.

23. JOB EXCEEDS (CI location)'S CAPACITY (number which is the equipment units required for that build)/(number of design capacity equipment units uncommitted)

Shows that the remaining design capacity of the CI was insufficient to complete this job.

24. (Location) HAS CONTRACT

Only one CI may be used for two private construction contracts on the same parcel.

C. $CASH Error Messages

1. (input) IS NOT A VALID CODE

If the wrong secondary code is used.

2. AS HAS NO CASH

If you try to transfer cash to or from Assessment Department.

3. FOURTH ENTRY (or FIFTH ENTRY) MUST BE CAP OR CUR

Cash transfers from or to a department must indicate which account. No department has a private (PVT) account.

4. (team; PZ or CH) HAS ONLY A (CAPITAL OR CURRENT) ACCOUNT

The chairman only has current account and PZ has only capital account. Remember: column D tells the account <u>from</u> which the cash is coming; column E tells <u>to</u> whom it is going.

5. ONLY CHAIR MAY USE (code)

Only the Chairman may use other than the C code in column A.

6. (team) DOES NOT RECEIVE APPROPRIATIONS

Neither economic teams, UT, BUS, RAIL nor CH receive appropriations. Cash transfers may be used.

7. NOT AN APPROPRIATION - DIFFERENT JURISDICTION

One cannot transfer money across jurisdiction with use of appropriation. Cash transfer may be used.

8. WRONG SUBSIDY

If in column A you try SB to subsidize a department or CAPS or CURS to subsidize an economic team.

9. (team) DOES NOT RECEIVE SUBSIDY

Only economic teams, Utility, Bus, or Rail Departments can receive subsidies.

10. NULL TRANSACTION

Cannot transfer money within the same account.

11. (team) ONLY HAS (amount)

If attempt is made to transfer more money than is in the running account. Remember that inputs preceding this one have already been processed. On the other hand, inputs following this have yet to be processed.

NOTE: Money may not be transferred to or from social accounts.

D. $PU (purchase) Error Messages

1. OUTSIDE DOES NOT BUY LAND

If you try to have OU purchase (i.e., OU as the decision-maker).

2. BUS CANNOT OWN LAND

The Bus Department may not acquire land.

3. DIFFERENT AREAS

If departments in different jurisdictions attempt to transfer land (this is checked before the checks represented by numbers 7 and 8 below).

4. ONLY DEPARTMENT SELLS PART TO PRIVATE

Private buyer always has to put a 0 in column D or leave it blank.

5. (team) OWNS (location)

Incorrect owner specified.

6. (x%) REQUIRED - ONLY (y%) AVAILABLE

Seller does not own as much of the parcel as the departmental decision-maker requested.

7. (location) IS IN (jurisdiction number)

Department must purchase only within its own jurisdiction boundaries.

8. (OU) CAN ONLY SELL 0 ON (location)

If economic team bids on a parcel where 100% is consumed by preempt and/or government owners.

9. (location) IS IN JURISDICTION (number)

Jurisdiction specified for seller (column C) is not of the location (from the seller's point of view).

10. (location) COST $ (amount)-(team) ONLY HAS $ (amount)

Team must have sufficient cash to purchase land.

E. $OTHER and $CVPT Error Messages

The following functional codes are used as part of the following error messages:

RENT - set rents

EMPLOY - hire part-time workers or employ population units

MAINTN - set maintenance levels

PRICE - establish prices

CNTRCT - contract to purchase BG and/or BS

ZONING - change zoning

WELFRE - set welfare payments

EDUCAT - operate adult education

UTSERV - establish utility service

INVEST - purchase or sell conservative or speculative investments

BORROW - borrow money from outside system

STOCK - purchase or sell rolling stock

On loans and bonds that are successfully floated, the following message is printed which indicates the interest rate to be paid:

INTEREST IS (percent)

<u>The First Nine Messages Apply to Director Inputs Only</u>:

1. THERE IS A CI AT (location)

   If NOCI is input and there is a CI on the board.

2. USE $CVPT FOR (specific decision-code)

   If $OTHER is used when PI(RPI) or PLND (RPLND) is being input.

3. (PI or PLND) REQUIRES SPECIFICATION OF PERCENT OF PARCEL

If there is either no or zero specification of percent of parcel for PI or PLND decision.

4. (location) IS IN (number of jurisdiction)

If a PI or RPI decision and decision-maker is not in the correct jurisdiction.

5. (number) % IS REQUIRED - ONLY (number) % IS AVAILABLE

There is less land available for PI or PLND than the input specified.

6. PI (or RPI) COSTS $ (amount) - PZ (number) ONLY HAS $ (amount) CAPITAL FUNDS

PZ Department has insufficient cash to carry out the transaction involving public institutional land.

7. THERE IS NO PI ON (location)

If an attempt is made to remove PI and no PI exists at that location.

8. NO MORE PI

If PI and there are already 45 parcels with PI on them, i.e., the maximum has been reached.

9. ONLY (number) PERCENT OF (location) IS (PI or PLND)

If an attempt is made to remove more PI or PLND than presently are on that parcel.

"Function" appearing in parentheses indicates that one of the functional codes listed above will appear in that position of the edit message.

10. EA IS AN INVALID CODE

If team other than SC tries to make decisions for adult education. This refers to the secondary code appearing in column A.

11. TEAM (name) DOES NOT (function)

Indicates that the particular team may not perform this function.

12. (entry) IS AN INVALID CODE

If the specific decision code is not a valid code.

13. USE $OTHER, -- (team name) SPECIFIES (function) SYSTEMWIDE

If $CVPT is used when $OTHER is appropriate. Recall that $CVPT is only used when making a decision for a specific location.

14. (team) SPECIFIES (function) BY LOCATION

If $OTHER is used when $CVPT is appropriate.

15. (team name) (function) IS TOO (HIGH or LOW)

If maximum or minimum is exceeded for $OTHER inputs.

16. (function) AT (location) IS TOO (HIGH or LOW)

If maximum or minimum is exceeded for $CVPT inputs.

17. LOCATION ERROR

If intersection or road location is input when parcel is expected.

18. (location) IS A (land use) AND DOES NOT (function)

The land use on that parcel does not perform the indicated function. This error most often occurs when an economic decision-maker attempts to set a price for an HI, LI, and/or NS.

19. (location) HAS NO ATTACHMENT

Program error: please notify Envirometrics

20. (location) MAINTENANCE SET TO MAXIMUM -- (number)

Maintenance level is set to the maximum possible: twenty points above the lowest QI ever reached for a residence.

21. (function) AT (location) IS TOO (HIGH or LOW)

Picks out which locations on a list have exceeded the limits.

22. THERE IS NO (SC or MS) AT (location)

When maintenance or employees are set for a location at which no appropriate development exists.

23. (location) IS IN (jurisdiction number)

If SC or MS decisions are made in the wrong jurisdiction.

24. JUST ONE PRICE

If more than one price is given for utility service.

25. ZONE OR MILE

If the bus or rail department inputs both a zone and per mile fare; only one may be specified.

26. (number) IS NOT A ROAD LEVEL

If road maintenance is specified for other than 1, 2, or 3 level.

27. ONLY (number) SALARY(S)

SC and MS hire one class. This message shows the number of salaries that should have been input by the department.

28. (team) OWNS (location)

If the team specified does not own the location of the BG or BS for a contract input.

29. (team)'S (land use) AT (location) HAS NO CONTRACT WITH (department)

If the location is not a BG or BS or there was no contract to begin with in the case that the decision-maker was attempting to eliminate a contract.

30. ONLY PZ CAN ZONE

If some other decision-maker attempts to zone.

31. (number) IS NOT A ZONING CODE

If invalid zoning code is used.

32. ONLY PZ (jurisdiction) CAN REZONE (location)

If a jurisdiction tries to zone a location in that jurisdiction.

33. CANT CHANGE (location)

If you try to reallocate service for a parcel that has a utility plant on it.

34. (parcel location) EXCEEDS (plants) CAPACITY

Limits of 12700 units installed or 2400 units served from any level utility plant have been exceeded.

35. (location) USES MORE THAN LEVEL (number)

Try to reduce service on a parcel below what is n needed by the development already on the parcel.

36. UT (jurisdiction number) ONLY HAS $ (amount)

If utility department does not have enough money to build all or part of new utility service extensions.

37. NONCONNECTABLE (location)

Lack of contiguity or lack of funds to provide the attempted extension of utility services.

38. NO UTILITY PLANT ON (location)

Wrong location given (in column C). Often columns B and C are reversed on the player's input decision form.

39. (number) NOT A UTILITY LEVEL

Only accepts the digits 0 through 9 as valid utility levels.

40. PAYMENT IS TOO HIGH

If welfare is specified as greater than 100 (i.e, $10,000 per unemployed worker).

41. (CH or PZ) DOES NOT GET (2 or 25) YEAR BONDS

If CH tries to acquire a current bond for PZ or a capital bond for himself.

42. ALREADY 21 BONDS

If there are already 21 bonds for a single department.

43. SCALE BOND IN 10,000'S

If bond for more than $3 billion is input. This points out that the decision-maker probably forgot to scale his input amount.

44. BOND OF $ (amount) EXCEEDS DEBT LIMIT OF $ (amount) PRESENT DEBT IS $ (amount)

If debt limit for a particular department is exceeded.

45. USE BONDING ROUTINE

If LO (column A) is used for a government department.

46. USE CODE (LO or BO)

If BO (column A) is used with a team as the lender or LO is used with no team specified as the borrower.

47. ONLY 2 OR 25 FOR TERM

If a term of other than 2 or 25 years is specified (column C for BO: D for LO)

48. INTEREST NONNEGOTIABLE

If an interest rate on a BO decision is specified.

49. LOAN MAY NOT BE MADE - 14 MADE ALREADY

If there are already the maximum of 14 loans granted by the decision-making team.

50. (amount) LOAN EXCEEDS LIMIT OF (amount that can still be borrowed) - TOTAL DEBT LIMIT IS (amount) - PRESENT DEBT IS (amount)

The economic team loan is larger than the amount that can be borrowed.

51. (team) ONLY HAS $ (amount) IN (CONSERVATIVE or SPECULATIVE) INVESTMENTS

If attempt is made to sell more in stocks than a team has.

52. INVEST COSTS $ (amount) - (team) ONLY HAS $ (amount) IN CAPITAL FUNDS

If team tries to invest more money in stocks than it has available in cash.

F. $TAXES Error Messages

1. (number) EXCEEDS TAX MAXIMUM OF 99

If a tax rate of too many mils is entered. This maximum tax rate of 9.9% can be exceeded by placing a "1" in the final position on the input card.

2. ONLY CH1, CH2, OR CH3 CAN ENTER TAXES

If some illegal team entry is made.

3. L, D, RI, EI, RA, EA, G OR S

If some code (column A) other than the ones listed is entered.

G. $FSA Error Messages

1. ERROR IN FSA DATA - TEAM, LEVEL, TYPE, N, LOCS
(and then repeats the line of input data

This message is printed for any input errors when requesting federal-state aid.

H. $REDIST Error Messages

1. (team) CANNOT REDISTRICT

If wrong team identification is used. Only MS and SC departments may redistrict.

2. (location) IS IN JURISDICTION (number)

The specified parcel is not in the jurisdiction of the decision-maker (MS or SC).

3. (location) HAS NO (MS or SC)

If no SC or MS is on the parcel to which the district is being assigned. If a new plant is being constructed you cannot redistrict until the EDIT preceding the round in which the plant will appear.

I. $RAIL Error Messages

1. (team) CANNOT ENTER RAIL INPUT

If other than RAIL is used as the decision-maker

2. RAIL IS NOT FEASIBLE IN THIS SIZE CITY

If rail decisions are made in the CITY III model when a population unit equals 50 people (small scale).

3. LIST MUST BE OF PARCELS

Land list (column C - track construction input) must contain even-numbered coordinates.

4. (entry) IS NOT A VALID INTERSECTION

Not on the board or it contains an even-numbered coordinate.

5. RAIL ONLY HAS $ (amount) - NO STATION BUILT AT (location)

If the department does not have enough money to pay for the station construction.

6. ONLY (number) MORE TRACK SECTIONS MAY BE BUILT

3955 is the most segments possible and as you get within 500, this message prints. If no (zero) more track sections can be built then the inputs are rejected.

7. NO RR LAND IS UNUSED AT (location) -

No land available on parcels designated to supply land for track rights-of-way.

8. LACK OF PARCEL (location) HAS PREVENTED RR CONSTRUCTION

If you require land from a parcel but do not list that parcel or contributing land.

9. RR CONSTRUCTION COSTS $ (amount) - RAIL HAS $ (amount)

If department does not have enough cash for track construction.

10. RAILROAD NOT BUILT BETWEEN (intersection) AND (intersection)

This message prints anytime that a rail segment is not built.

J. $ROUT Error Messages

1. *** BUS OR RAIL NOT SPECIFIED

Only Bus and Rail may make decisions concerning routes.

2. NEW ROUTE, OLD LEVEL NOT ZERO OR NEW LEVEL NOT ZERO

If where a new route is specified the old level is not designated as zero or if you try to eliminate a route that does not exist.

3. ALREADY 32 ROUTES

Maximum sum of bus and rail routes is 32.

4. ERROR MORE THAN 31 STOPS OR NO ROAD

There cannot be more than 31 stops on a route. No bus route over a road bed may be specified.

5. NO TRACKS BETWEEN (intersection) AND (intersection)

If a rail route is specified where no tracks exist.

6. NO STA. OR TRACK AT INT. (intersection location)

If you specify that a route stops at an intersection with no station.

7. ERROR IN LEVELS

If the old level specified is not the actual level of that route.

K. $TIME Error Messages

1. ONLY PVT ALLOCATES

Only a social decision-maker can input a time allocation decision.

2. ONLY L1, L2, L3, M1, M2, M3, H1, H2, OR H3

These population unit codes by jurisdiction are the only ones allowed (column A)

3. HI CANT ALLOCATE FREE SCHOOL

If time for a PH has been allocated to free education (column B).

4. TIME ADDS TO (total of units if over 100)

Rejects an input if an allocation of more than 100 time units was attempted.

5. LOCATION ERROR

If intersection or road segment is input as a location for P1's.

6. (team) DOES NOT CONTROL (H, M, or L) ON (location)

If a team attempts to make time allocation decisions for a class on a parcel over which it does not have control.

7. THERE ARE NO (H, M, L)'S ON (location)

If time is allocated for a class of P1's on a parcel where no members of that class reside.

8. (location) IS IN (jurisdiction number)

If the specified location is not in the jurisdiction indicated by the number after H, M or L (column A).

L. $BYCT Error Messages

1. (location) IS (UNDEVELOPED or a RESIDENCE)

If a boycott is attempted at a location which is either undeveloped or a residence.

2. (location) IS A (land use)

If shopping boycott is attempted at a location with a land use that does not sell.

3. ONLY 44 BOYCOTTS

Maximum of 44 boycotts is allowed in the entire system.

4. (team)'S (class or land use)'S ARE NOT BOYCOTTING (SHOP, WORK, or USE) (location)

If you attempt to stop a boycott that does not exist. Remember S in column E means stop, not start.

5. (team)'S (class or land use)'S ARE ALREADY BOYCOTTING (SHOP, WORK, or USE) - (location)

6. (department) DOES NOT HIRE

Try to boycott work at a department that does not hire population units.

M. $VALUE Error Messages

1. (team) DOES NOT SET TIME VALUE

   If a non-social decision-maker is listed.

2. L, M, OR H

   If column A does not contain either L, M, or H.

N. $ASMNT Error Messages

1. (entry) IS NOT A RECOGNIZABLE CONTROL WORD

The wrong code has been used.

2. IT IS TOO LATE TO ENTER (entry) -- USE OOPS AND START ALL OVER

If a decision at a higher level of application was made after a lower level decision had been input. For example, using the L code after LHI was used.

3. SOMEONE ON TEAM (team name) IS TRYING TO ENTER ASSESSMENT INPUT

Some illegal decision-maker code was used.

4. (location) CANNOT BE ASSESSED

If a special assessment is attempted for an non-privately-owned parcel.

5. DATA ITEM (item) IS NONSENSE

If location specified is off the board, intersection, or road segment or if assessment rate is greater than 1000 mils (100%).

6. ZONE (number)IS EMPTY BUT MAY BE EXTENDED

If a dummy zone is intentionally specified or if a zone with no parcels within it (the same intersection was listed twice as the boundaries of the zone) is accieently specified.

7. (location) IS IN (jurisdiction number)

If a special zone or a special assessment deals with land outside the proper jurisdiction. If the error is for a special zone, the further message is ZONE REJECTED.

8. ZONE (number) HAS NOT YET BEEN DEFINED

If a zone is specified to have the same characteristics as another zone, which has yet to be defined.

9. AS INTERNAL ERROR

A program error, please notify Envirometrics.

O. The Concluding Messages

As was mentioned earlier, the final Edit messages for bids on auctioned parcels of land, federal-state aid requests, and redistricting errors are printed at the end of all the other edit messages. They appear as shown below:

1. Auctioned Parcels

The following is a sample output:

```
                    ******  END OF INPUT DATA  ***
B   'S   $    102000 BID ON 11818 ACCEPTED  .2402  /  .8580
C   'S   $     51000 BID ON 11426 REJECTED  .7743  /  .1790
A   'S   $      5100 BID ON 11426 REJECTED  .6653  /  .0000
B  OWNS  7430
F   '    $    184620 BID ON  8838 REJECTED  .6583  /  .2649
```

Note that B's bid was accepted. This is because the probability of B's bid being accepted (the number to the right of the "/") was greater than a randomly drawn number (the number immediately to the left of the "/"). The bids by C, A and F were rejected because the probabilities generated by the amount of money they bid were less than randomly drawn numbers. Some team made a bid for parcel 7430 but team G had already purchased that auctioned parcel by bidding more than the asking price.

2. Federal-State Aid

The second part of the final messages is a list of federal-state aid data in the following format (the numbers are for purposes of illustration only assuming a two jurisdiction area).

JUR.	STUDENTS	SCHOOL	POPUL.	PARKS
1	34040	2	252	99
2	28610	2	299	111
3	0	0	0	0

For jurisdiction 1, there are 34,040 students, two levels of schools, 252 population units and 99 units (1/25's of a square mile) of parkland.

Then each of the individual requests are listed (in order of HY, PZ, and SC) and if the aid was granted this is indicated. In the case of each request, the number following the word "chance" is the probability that the aid will be received. Sample messages are:

FOR HYWAY FROM 10933 TO 10935 CHANCE .50

REQUEST GRANTED (if aid request is approved, and no message if the request is rejected).

25.0% CHANCE FOR AID OF $ 50000 FOR PZ1

REQUEST GRANTED (if aid request is approved, and no message if the request is rejected).

*3. Redistricting Error Messages

If any part of the redistricting of a department in a jurisdiction is invalid, then all redistricting by the department in that jurisdiction is rejected. The message which appears is:

PROPOSED REDISTRICTING RESULTS IN DISTRICT FOR (SC or MS) AT (location) BEING DISCONTINUOUS (SC or MS) REDISTRICTING REJECTED FOR JURISDICTION (number)

There is no redistricting message at the conclusion of the edits if no errors were made.

---

* See page 17 of Appendix G for an explanation of how Redistricting inputs are processed.

APPENDIX E

MAXIMUMS AND MINIMUMS IN THE CITY III MODEL

INPUT AND FILES

The game director should be aware of a few constraints that have been placed on the size of inputs and the size of growth that the model can handle. Some of these maximums have been imposed by the lack of computer space and others are practical limits that should never be achieved. The maximums fall into two classes -- those related to input constraints and those related to the number of pieces of data that can be associated with a particular item (a file maximum) an example of the first type of constraints is that no value greater than $500 can be inputted for the dollar value of time. An example of the second type or file constraint is that no more than 63 schools may be built. The director should also note input minimums.

In addition to including EDIT program input restrictions, the manner in which the director may override some of these restrictions is illustrated in Section C of this appendix. An appendix (*) before an input maximum/minimum listed in Section A denotes that this input restriction can be overridden.

A. Input Maximums/Minimums

1. $OTHER/=dm/LO - no economic team may borrow from another at an interest rate above 12.7 percent.

2. $CVPT/=SCx or MSx/E - no more than 15 population units from either class may be assigned to work at a single shcool or municipal service location.

3. $FSA - the Highway Department may not request aid for more than 30 road segments per round and the Planning and Zoning Department may not submit more than three requests for aid in a round. The EDIT program will consider no more than five (5) FSA requests by the Highway Departments from all jurisdictions. It will process the first five received and disregard all others.

4. No input of more than 10 digits.

5. $PU - $262,143,000 is the largest possible price and no more than 100% of parcel may be purchased.

6. $BUILD - $671,080,000 is the largest possible price. (Prices offered and charged at employment locations must be between 50% to 150% of normal.)

7. $TIME - up to 100 units may be allocated in each classification but not more than 100 total units may be allocated.

*8. $VALUE - the player input check does not permit more than $100 per unit. The director limit is $500.

9. $CASH - $3,435,800,000 is the largest possible amount of an appropriation or cash transfer.

*10. $TAXES - the input check permits no more than a 9.9% (99 units) tax rate. The limit on the director is 1000 mils (100.0%).

11. $ASMNT - special assessment $1,196,100,000.

12. $BYCT - no more than a total of 44 boycotts are possible at a given time by a decision-maker, therefore, this is the upper limit on the number that can be input for a given round.

13. $RØUT - route numbers 1 to 511 may be used. No other numbers are accepted.

14. No negative numbers.

The Edit (input processing) program puts practical constraints on the following input:

*15. $CVPT/=edm/P (prices)
R (rents)
S (setting wage levels)

Any input greater than 150% or less than 50% of the typical price, rent, or salary will be rejected.

*16. $OTHER/=MSx or SCx/S - salaries to Municipal Services and School Department employees may not be less than 50% of greater than 150% of typical salaries.

*17. $OTHER/=UT(1,, 2, or 3)/P - utility prices must be in the range of $5000 to $15000.

B. File Maximums

1. Number of economic teams (loaded value) = 26

2. Number of social teams (loaded value) = 26

3. Number of schools - 63

4. Number of municipal services = 127

5. Product of the number of PG's or PS's (including the outside as one) and resident class by parcel = 8400

6. Customers per PG or PS = 470

7. Number of loans by an economic team = 14

8. Number of bonds by a government department = 22

9. Maximum team cash = $30 billion

10. Maximum dollar number in any government field = 99 million.

C. How the Director Can Override Certain Input Maximums and/or Minimums

In order to experiment with several innovative economic, social or government programs such as co-operative commercial establishments, the director may desire to override programmed input checks. This option exists for pricing (including rents), setting wage rates, setting tax rates (above 9.9%), and setting the dollar value of time. Note that negative numbers may never be input, although zero ("0") is possible.

To illustrate the use of this option the general format of the input will be provided. All capital letters mean that those letters are mandatory for the decision to go through; all commas, dollar signs, equals signs, and slashes are in their proper places; lower case letters show where the variable values are to be input*, the additional values and characters which the director must input are denoted by the box around them.

1. For salaries to MS and SC Department employees:

   $OTHER/=MS1,etc/S, amount,amount [0, A]

2. For utility prices out of the $5000 to $15000 range:

   $OTHER/=UT1 (or UT2 or UT3)/P, amount [,1]

3. For price, rent and salary changes for economic decision-makers:

   $CVPT/=edm/P,location,amount [0, 0, A]
   R,location,amount [0, 0, A]
   S,location,amount,amount,amount [,A]

4. For taxes above 9.9%:

   $TAXES/=CH1 (or CH2 or CH3)/type,amount [,1]

5. For setting dollar value of time above 100:

   $VALUE/=sdm/H (or M or L),amount [,1]

---

* See Director's Summary Input Explanation Form in Appendix C for clarification of column values.

6. In order to guarantee 100% probability on a land purchase from the outside system

$PU/=dm/location,amount ($), OU, percent ,1

APPENDIX F

LIST OF OUTPUT SECTIONS

(Items marked with asterisk do not appear until after round 1)

	NAME OF OUTPUT	FUNCTION
1.	@XQT EDIT*	Shows acceptance or rejection of each input decision
2.	HOUSING DISSATISFACTION FOR PL*	Histogram of number of PL's by housing dissatisfaction level
3.	HOUSING DISSATISFACTION FOR PM*	Histogram of number of PM's by housing dissatisfaction level
4.	HOUSING DISSATISFACTION FOR PH*	Histogram of number of PH's by housing dissatisfaction level
5.	INITIAL POPULATION*	Pl by class and jurisdiction before migration and number of Pl's displaced by demolition of housing
6.	PERSONAL DISSATISFACTION FOR PL*	Histogram of number of PL's by personal dissatisfaction level
7.	PERSONAL DISSATISFACTION	Histogram of number of PM's by personal dissatisfaction level
8.	PERSONAL DISSATISFACTION FOR PH*	Histogram of number of PH's by personal dissatisfaction level
9.	MIGRATION STATISTICS*	In-migration, out-migration, internal migration and natural population growth by jurisdiction and class.

10.	ASSESSMENT CONSTANTS	Design parameters that are not changed
11.	ASSESSMENT FACTORS	Assessment rates for land and developments by type that are set by the assessment department by jurisdiction.
12.	ASSESSED VALUE OF PRIVATELY OWNED LAND	Map of assessed values of land for that percent of the parcels privately owned in in $100,000's
13.	DEVELOPMENT ASSESSMENT AMOUNT MAP	Map of total private real property assessments in $100,000's
14.	TOTAL ASSESSMENT AMOUNT	- Map of total private real property assessments in $100,000's
15.	PARCELS UP FOR AUCTION	Tabular list of parcels for sale and their asking prices.
16.	AUCTION ASKING PRICE MAP	Map of parcels for sale and their asking prices in $1,000's

17.	MARKET VALUE OF PRIVATELY OWNED LAND FOR 100% OF PARCEL	Map of market value of parcels assuming that the full parcel were privately owned in $100,000's.
18.	DEVELOPMENT MARKET VALUE MAP	Map of actual market values of developments in $100,000's.
19.	TOTAL MARKET VALUE OF PRIVATELY OWNED LAND AND DEVELOPMENTS	Map of combined market value of private land and developments in $100,000's.
20.	ECONOMIC STATUS MAP	Map of private land ownership and development that also shows the zoning, utility level, percent of parcel undeveloped, and the road network.
21.	GOVERNMENT STATUS MAP	Map showing government buildings (schools, municipal services, utility plants, and terminals), parkland and road.
22.	SOCIAL DECISION-MAKERS	Map showing by residential parcel the social teams that control PH, PM and PL decisions.
23.	PREEMPTED LAND AND PUBLIC INSTITUTIONAL LAND MAP	Map showing the percent of each parcel that cannot be developed because of topographical constraints and the percent which is in public institutional use.
24.	DEMOGRAPHIC MAP	Map showing the population (in 100's) percent occupany, and quality index (QI) for all residential parcels, and the value ratio (VR) for all private non-residential developments (QI and VR figures show depreciated values before maintenance).
25.	PART-TIME WORK ALLOCATION FOR HIGH INCOME CLASS	Tabular list of residence location of part-time workers, their employers, the number of part-time units, and the yearly salary rate.
26.	PART-TIME WORK ALLOCATION	Tabular list of residence location of part-time workers, their employers, the number of part-time time units, and the yearly salary rate.

27.	PART-TIME WORK ALLOCATION FOR LOW-INCOME CLASS	Tabular list of residence location of part-time workers, their employers, the number of part-time time units, and the yearly salary rate
28.	EMPLOYMENT SELECTION INFORMATION FOR LOW-INCOME CLASS	Tabular output showing the place of residence of all Pl's, their employers, the number of Pl's not employed and employed by each employer, the salary of each employer, the time units consumed in transportation to work, the cost of using an auto to go to work, the costs using a bus and/or rail to go to work, and the route used to travel to work whether by auto or public transit.
29.	EMPLOYMENT SELECTION INFORMATION FOR MIDDLE INCOME CLASS	Tabular output showing the place of residence of all Pl's, their employers, the number of Pl's not employed and employed by each employer, the salary of each employer, the time units consumed in transportation to work, the cost of using an auto to go to work, the costs using a bus and/or rail to go to work, and the route used to travel to work whether by auto or public transit.
30.	EMPLOYMENT SELECTION INFORMATION FOR HIGH INCOME CLASS	Tabular output showing the place of residence of all Pl's, their employers, the number of Pl's not employed and employed by each employer, the salary of each employer, the time units consumed in transportation to work, the cost of using an auto to go to work, the costs using a bus and/or rail to go to work, and the route to travel to work whether by auto or public transit.
31.	EMPLOYMENT SUMMARY	Information by class and total for the number of Pl's employed at their design level or at lower levels, the number unemployed, the total number of Pl's, the part-time units worked, and the number of jobs full time that were not filled by the local labor force.

32.	SCHOOL MAP	Map showing the location of schools, school boundaries, and the number of students attending public schools and and attending private schools.
33.	PERSONAL GOODS ALLOCATION-SUMMARY	Tabular output showing the identification number assigned to each PG establishment, its location, owner, level, effective capacity, actual capacity used, price, and gross sales. For each sustomer it shows the store to which it is assigned, the customer location and type or class, the customer's owner, the consumption units (including those for maintenance and recreation), transportation costs (shadow costs in the case of residences) the purchase cost (total cost in the case of residences), and total cost.
34.	PERSONAL GOODS ALLOCATION MAP FOR HIGH CLASS	Map showing the location of all PG's and the number of the PG to which each PH customer was assigned
35.	PERSONAL GOODS ALLOCATION MAP FOR MIDDLE CLASS	Map showing the location of all PG's and the number of the PG to which each PM customer was assigned.
36.	PERSONAL GOODS ALLOCATION MAP FOR LOW CLASS	Map showing the location of all PG's and the number of the PG to which each PL customer was assigned.
37.	PERSONAL GOODS ALLOCATION MAP FOR RESIDENCES	Map showing the location of all PG's and the number of the PG to which each residence was assigned for purposes of maintenance purchases.
38.	PERSONAL SERVICES ALLOCATION SUMMARY	Tabular output that is identical in format to that for PG described under #33.
39.	PERSONAL SERVICES ALLOCATION MAP FOR HIGH CLASS	- Same as #34
40.	PERSONAL SERVICES ALLOCATION MAP FOR MIDDLE CLASS	- Same as #35
41.	PERSONAL SERVICES ALLOCATION MAP FOR LOW CLASS	- Same as #36

42.	PERSONAL SERVICES ALLOCATION MAP FOR RESIDENCES	- same as #37
43.	BUSINESS GOODS ALLOCATION SUMMARY	Similar to that for #33 except that residences are not customers of BG
44.	BUSINESS GOODS GOVERNMENT CONTRACTS	Tabular list showing the identification number of each BG that has a government contract, the contracting department, the number of CU's purchased, and the cost paid by the department.
45.	BUSINESS GOODS ALLOCATION MAP	Map showing location of all BG's and the number of the BG to which each private BG customer in the local system was assigned to shop.
46.	BUSINESS SERVICES ALLOCATION SUMMARY	Similar to that for #33 except that residences are not customers of BS.
47.	BUSINESS SERVICES GOVERNMENT CONTRACTS	Same as #44
48.	BUSINESS SERVICES ALLOCATION MAP	Same as #45
49.	TERMINAL CUSTOMERS	Tabular list of the location, business type (land use), and terminal requirements of each terminal user. Each terminal is assigned an identification number and its location and level are noted.
50.	TERMINAL ALLOCATION	Map showing the number of the terminal to which each terminal user in the local system is assigned.
51a.	SOCIAL DECISION-MAKER OUTPUT	Tabular list of socio-economic characteristics of the local system population separated by social decision-makers, jurisdiction, income class, and parcel location.
51b.	BOYCOTT STATUS	List of outstanding boycotts for each social team. Information for each boycott includes type and class of boycott and economic owner and establishment boycotted.
52.	ECONOMIC RESIDENCE OUTPUT	Tabular list of characteristics of local housing separated by economic team.
53.	ECONOMIC BUSINESS OUTPUT	Tabular list of characteristics of local business separated by team and listed in order of LI, HI, NS, BG, BS, PS and Construction Industry contracts.

54.	ECONOMIC NEW CONSTRUCTION	Tabular list showing location of that team's new construction, the type and the old and new level of activity, the location of the construction industry, the contracted price, rent to be charged (if residence) or salary offered (if employer), the quality index (if residence) or price per CU (if commercial), and the status of the construction
55.	ECONOMIC BOYCOTT STATUS	Tabular list showing the team boycotting the income class (if a social boycott), or land use (if an economic boycott), and the function (work or shop) being boycotted. Also shown are the location, land use, and team being boycotted.
56.	ECONOMIC LAND SUMMARY	Tabular list of the location of parcels owned by a team, their assessed value, percent that is undeveloped and private, the taxes on undeveloped land, the percent publicly developed and undeveloped, the percent undevelopable because of topographic constraints, the utility capacity available and used.
57.	ECONOMIC LOAN STATEMENT	Tabular list showing borrower, lender, interest rate, years remaining on the loan, the original principal, and the annual payment.
58.	ECONOMIC FINANCIAL SUMMARY	A cash flow statement showing expenditures and income, a portfolio of conservative and speculative stocks, and a balance sheet of assets and liabilities.
59.	HIGHWAY DEPARTMENT REPORT	A financial report showing capital and current expenditures and revenues, outstanding bonds, a summary of maintenance levels and expenditures by road type, a summary of road conditions, a terminal status report, a list of undeveloped land, and a status report on available federal-state aid.

60.	HIGHWAY DEPARTMENT CONSTRUCTION TABLE	Tabular list showing the construction firm, the location of the road being built, the status, the old and new level, the contracted price, and the dollar amount of federal-state used.
61.	HIGHWAY MAP	An eight page map that shows the private land use on each parcel, the type of each road, the level of each terminal and the value ratio and peak-hour congestion along each road segment.
62.	BUS COMPANY REPORT	A financial report showing capital and current revenues and expenditures outstanding bonds, employment costs, the amount and condition of rolling stock, the fare structure, passengers and total fares by route, and the number of passengers by each segment of each route.
63.	PARTIAL TRANSPORTATION NETWORK MAP (2 copies)	Map showing the road and rapid rail network
64.	FULL TRANSPORTATION NETWORK Map (2 copies)	Map showing all roads, rail stations, and bus lines
65.	LIST OF RAIL TRACK SEGMENTS AND STATIONS	List of track segments (lengths of track between two intersections) and rail stations.
66.	RAIL COMPANY REPORT	Same as #62
67.	RAPID TRANSIT COMPANY CONSTRUCTION TABLE	Tabular list showing location of construction industry, tract locations, status of the construction, and the contracted price.
68.	SCHOOL DEPARTMENT REPORT	Tabular data on school unit location, level, maintenance level, value ratio, students attending, teachers, student-teacher ratio, and use index. Also data on undeveloped land, BG and BS contracts and cost of purchases, adult education summary, and several total school statistics.

69.	SCHOOL DEPARTMENT CONSTRUCTION TABLE	Tabular list showing the location of the construction firm, the school building location, the status of construction, the old and new level of the school, the contracted price, the amount of federal-state aid used, the maintenance level for the school, and the number of PM's and PH's assigned to work at the School.
70.	SCHOOL FINANCES	List of capital and current revenues and expenditures, outstanding bonds, and available federal-state aid by school site location.
71.	MUNICIPAL SERVICES MAP	Map showing the location of municipal services and the identification number of the MS serving each parcel.
72.	MUNICIPAL SERVICES DEPARTMENT REPORT	Tabular list of MS locations, maintenance level, value ratio, effective capacity, loading (units of capacity used), number PL and PM's working, and the MS use index. Also shown are the salary levels, contracts to purchase BG and BS, the location of undeveloped land, and outstanding bonds.
73.	MUNICIPAL SERVICES DEPARTMENT CONSTRUCTION TABLE	Tabular list showing the location of the construction firm, the MS location, the status of construction, the old and new level of the MS, the contracted price, the maintenance level, and the number of PLs and PM's assigned to work at the MS.
74.	MUNICIPAL SERVICES FINANCES	List of capital and current revenues and expenditures.
75.	UTILITY MAP	Map showing utility plant locations, the number of the utility plant serving each parcel that has utility service, and the level of utility service on each of those parcels.
76.	UTILITY DEPARTMENT REPORT	Tabular list of utility plants, their location, level, units installed from each plant, units served, total operating costs per unit, and income derived from charges. Also listed is the charge per unit to customers, undeveloped land, and outstanding bonds.

77.	UTILITY DEPARTMENT CONSTRUCTION TABLE	Tabular list showing the location of the construction firm, the site of the utility plant, the status of the construction, and the contracted price.
78.	UTILITY DEPARTMENT FINANCES	List of capital and current revenues and expenditures
79.	PARKLAND MAP	Map showing the amount of parkland available per parcel and a usage index for each park.
80.	ZONING MAP	Map showing the zoning classification of each zoned parcel and a key showing the definition of each zoning classification.
81.	PLANNING AND ZONING DEPARTMENT REPORT	Shows total jurisdiction population, total amount of parkland, outstanding bonds, and capital revenue and expenses.
82.	BUDGET - CHAIRMAN AND COUNCIL OUTPUT	Shows the total jurisdiction population, the welfare payment per unemployed worker, and the financial summaries for municipal services, schools, highways, planning and zoning, utilities, and the chairman's account. Also included are outstanding bonds.
83.	FINANCIAL SUMMARY	A tabular list showing by department the previous cash balance, capital revenues, current revenues, capital expenditures, current expenditures, and new cash balance
84.	TAX SUMMARY	Tabular list showing by the eight possible tax bases, the dollar amount of the tax base, the tax rate, and the revenue generated.
85.	DEMOGRAPHIC AND ECONOMIC STATISTICS	Tabular list by jurisdiction and for the total system of population and its characteristics, land usage, housing, employment, earnings, income from the national economy, outflows to the national system, and national business cycle effects.

APPENDIX G

ELABORATION OF SOME PLAYER AND COMPUTER PROCESSES

INTRODUCTION

This Appendix is intended to provide the Director with some detailed aspects of CITY III which are not explained fully in the Players' Manual. Frequently, players who know how the model works generally desire to understand it more deeply. The explanations will cover the following topics:

A. The Full-Time Employment Process -- the actual method of assigning workers to jobs.

B. The Part-Time Work Allocation Process -- an explanation of the manner in which population units are assigned extra work. Listing the factors involved permits inferences to be drawn for the extra work time allocation of social decision-makers.

C. The Commercial Process -- criteria used in the assignment of buyers to sellers.

D. The Effects of Time Allocation in Education -- the effects of time in adult education on the educational level of population units.

E. Bus and Rail Company Output -- detail on the meaning of several portions of Bus and Rail output including Transportation Network Maps.

F. The $REDIST Input -- an explanation of the manner in which redistricting decisions are processed; sources of input errors are highlighted.

G. Government Contracts with Business Services and Business Goods Establishments -- an explanation and illustration of how the player should input new contracts, replacement contracts, and elimination of contracts.

H. The Effects of the Outside System -- details on the business cycle (including determination of the interest rate on loans from the Outside) and on Federal-state aid and taxes; the role of the Outside in the Migration Process; the method of determining the value of outside-owned land parcels; the role of the outside in construction; the relation of outside suppliers of goods and services to the local system.

I. Business Profitability -- the assumptions underlining some of the parameters used in the economic sector to assure a reasonable rate of return for businesses (under "normal" conditions).

J. The Migration Process -- details on the calculation of personal and housing dissatisfactions, selection of in-migrants and out-migrants, and placement of Pl's into housing.

A. THE FULL-TIME EMPLOYMENT PROCESS

Each income class is considered separately, highest first. There are two major sections to the employment process: choosing a job and selecting the best mode of transportation to work. The former section will be discussed in detail first.

This operation occurs during the processing of each round's decisions. In this process, all jobs are considered "open" and are examined each round for possible new employment by qualified workers. But, for reasons explained below, workers do not always change jobs each round.

Another overall consideration is that in the first sort, in which workers of all classes "decide" to retain their present job or change to a possible new one, and in all subsequent matching the process is performed in order of class, high income class first. This process is always top down, meaning that in a job shortage, high income workers can take middle income jobs but never the reverse. Where workers of the same class are competing for the same job opening, the ones with the higher education level win.

There are occasions when some high income workers will be unemployed while all middle income workers will have jobs. This situation occurs when a high income worker cannot afford to either remain in his present job or take a new one (because his costs are too high, or because both job openings do not pay enough).

Note here that the emphasis is on what workers will or can afford to accept and not so much on what is available. This relationship is conditioned by several things, among them the supply and demand curve, what economic decision-makers decide to pay, how the government sector is providing transportation and general social sector dissatisfaction.

In order to choose a job, a Pl's estimated transportation cost to each job (using last round conditions) must be calculated. The best route to each employment location is calculated from each parcel containing high-income workers. Of course, the best route is the same for all workers of a class on a parcel. The "best" route is the cheapest influence by the usage of the transportation network last round and the dollar value of time traveling. Although the time cost is not paid by a worker in dollars, it is a significant factor in the selection of routes and modes of travel.

Generally, the transportation cost (weighted by time and money) is subtracted from the salary offered by each employment location, yielding the direct net income a worker would receive there. To reflect job stability the direct net income from a possible new job must exceed that of the last round's job by at least 10 percent before a worker will "consider" changing. This bias toward stability is accomplished by artificially increasing the new round's wage of the present job by 10 percent during the round's employment allocation process. Thus, the highest direct net income of a possible new job is compared with the artificially high wage of the present job during each round's employment allocation. Workers take the job with the highest apparent income, either the inflated wage of the present job or the highest direct net income of a possible new job.

In three situations -- where a business has been downgraded, where a construction industry has less need for labor this round, or in the case of public employment, where there was a cutback in requested employees -- the most educated employees are hired and the rest are considered still unemployed, if more employees are available for their previous jobs at a particular location than there are jobs available.

All high-income Pl's on a parcel have the same educational level. The best educated groups of Pl's try for jobs with the greatest direct net income. If there are not enough job openings for all high-income living on the parcel at their best employment location, as many as possible are assigned jobs there. The rest look for their next best job, again comparing the artificially inflated income of their present job with the direct income of a possible job (the repeat of the process mentioned above). The process is repeated until all of the workers of that class on the parcel have jobs, or until both the artificial and direct incomes are negative. Then the next best educated group is considered for jobs. If workers living on two or more parcels have the same education level, the order of consideration is random. The least educated group is considered for jobs last.

When all workers of the class have tried for jobs, the part-time employment process occurs. (See Section B of this Appendix.)

The entire employment process runs each time for the next lower class, plus those of the previous class still without full-time jobs who are put at the top of the list because of their higher educational levels.

When employment has been run for all classes, the new traffic congestion and actual transportation to work costs and modal choices are calculated. In other words, the origins and destinations of work trips are now known and the routing and modal choice must now be determined. The new and old congestions are compared. If the new congestion exceeds the old on any road segment or bus or rail route by more than the percent population increase plus 10%, the best route to work is recalculated for everyone, based on the new congestion. Jobs are not sought anew -- only routes to work. Of course, if a road or route is not overcrowded, the percentage increase in congestion is ignored as a factor in determining whether to recompute routes. The routing and congestion comparison process is repeated up to three times or until the change in congestion does not exceed the percentages given above. The final routes to work and usage by mode become the congestion considered in the next round's employment process.

In the case of government employment, no specific place of employment (i.e., no parcel) is designated. Rather, fixed transportation costs and travel times are used for each population class in round one. The dollar and time cost to travel to government full-time employment (SC, MS, BUS, RAIL) in subsequent rounds is the average for all other working population units. A single average time cost is calculated for all three population classes, whereas a separate average dollar cost is calculated for each class.

B. THE PART-TIME WORK ALLOCATION PROCESS

Social decision-makers realize that their population units seldom receive all the extra work for which time was allocated. As with the full-time employment allocation process, the P1's educational level is the most important factor in the assignment of part-time work units to extra work time allocation.

The supply of part-time work units, eighty of which are equivalent to one full-time job, is primarily determined by the levels of business activity in the system. The following table gives the fixed supply ratios of part-time units for each class of P1 per level of business activity.

LAND USE	LOW	MIDDLE	HIGH
HI	0	80	0
LI	80	80	0
NS	0	0	80
BG	0	0	80
BS	0	0	80
PG	160	80	0
PS	160	80	0

Variable supply of part-time work units (jobs) is provided in the two ways listed below.

CI - For each CI location, the supply varies from 0 - 100 units per class (each class is requested in equal numbers) according to the amount of construction labor units required in a particular round.*

SC - By jurisdiction the school department provides public adult education according to the number of middle and high income part-time work units it hires. This specification obviously can fluctuate considerably round-to-round.

*The total labor units required by a CI is divided by 50 to determine the full-time P1's required in each of the three classes. The remainder is multiplied by two to derive the number of part-time labor units.

Two lists -- one supply of and the other demand for part-time work units -- are created for each population class. The suppliers of part-time work units are ordered by the salary offered (proportional to full-time wage offered) with the highest salary placed first. Each entry on this list contains a location, a full-time salary per worker, and an amount of part-time work units available.

Each entry in the demand for units list is comprised of a residence group for which allowed time for extra work as defined by a parcel location, an average education level, and an average time allocation for extra work.* The number of Pl's in each group is the final item of information. This list is ordered on the basis of average education level with the highest levels first.

For each complete pass through the list of residence groups, the part-time work allocation process attempts to assign by class ten units of extra work to each population unit which has an unfilled extra work allocation. The process continues until either all requests (unfilled allocations) are filled or until the supply of part-time work units is exhausted.

First, the residence group at the top of the list (i.e., the one with the highest education level of those groups who have not yet been assigned work in that particular pass) is examined. The number of Pl's is multiplied either by ten or by a figure less than ten (if there are less than ten unfilled extra work time allocation units remaining) in order to obtain the group's request for part-time work units. For example, assume in the first pass that 6 PH's at 10026 have the highest education level and that the social decision-maker allocated 25 time units to extra work for each PH. The total demand for units of this group in the first pass is sixty (60). These population units will have their employment request of sixty part-time units met before any other high-income population units are considered.

Once the request is determined, the job supply list is examined. For each potential work location, a shadow automobile transportation cost per worker is calculated. This value is subtracted from the salary per worker to obtain a net income per worker which is used to determine the best job. Units from this best job are assigned to the

*Pl's of the same class who live on the same parcel. Each Pl so grouped has averaged, and thus identical, characteristics such as education level and time allocated for extra work.

residence group up to the amount of their request. If that particular job has an insufficient supply of part-time units available, the remainder of the request must be met by the second best job, and so on.

After the job units are assigned to the particular residence group, their per P1 unfilled extra work time allocation units are decremented by ten (or the figure less than ten) and they are placed at the bottom of the residence group list. Of course, if the residence then has no more units to be filled, they are dropped from further consideration.

Subsequently, a different residence group appears at the top of the list and the assignment process proceeds in the identical fashion. This continues until either of the two mentioned termination criteria are reached. High-income population units may not be assigned middle- or low-income part-time jobs, nor may middle take low or high, and so forth. With an income class, the only case in which a P1 would receive a part-time job before another P1 with a higher education level is the case in which the shadow transportation cost exceeded the remuneration expected from the particular job.

The implications for a social decision-maker in a play are fairly obvious. As much time as is feasible should be allocated to education in order to raise a P1's relative standing in terms of education level. Moreover, in order to boost the income of less educated P1's who are already worse off due to the effect of education level in full-time employment, a team should allocate no time to extra work for the highest educated members of the particular income class. This will enable the less fortunate P1's to be higher in the list of residence groups. Finally, note that the allocation of large amounts of time to extra work has no effect on the assignment of part-time units to population units.

C. THE COMMERCIAL PROCESS

The commercial process operates to accomplish the following objective:

- assign a buyer to the commercial establishment that gives it the lowest gross cost (commodity price plus transportation cost to the establishment)

subject to the constraints that:

- a buyer will have some bias to shop at the establishment which it shopped at last year,
- a buyer has a bias against shopping at a store that is near or over capacity ("crowded"),
- a buyer will refuse to shop at an establishment which it has boycotted.

Buyers and Types of Purchases

The buyers of commercial goods and services and their type of purchases are:

Customers	Business Goods and Services	Personal Goods and Services
Government Contracts (SC and MS)	X	
Basic Industry (fixed amounts and variable amounts based on maintenance)	X	
PG and PS (amounts based on sales and maintenance)	X	
Residences (for maintenance)		X
Population Units (fixed amounts)		X
Population Units (variable amounts based on time in recreation)		X

Transportation Costs

The transportation costs to each type of commercial establishment by road type are listed in the master tables.

Sellers' Price

The owner of each commercial establishment is free to set a price for that establishment. Prices are not allowed to be less than 50 percent or more than 150 percent of the typical local prices listed in the Economic Master Table.

The capacity of a commercial establishment is affected by its development level, the proportion of desired workers that are actually hired, and the value ratio of the establishment.

The Outside System can supply an unlimited amount of goods and services at 130 percent of the typical local price.

Assignment

The actual commercial assignment process is quite complex but the following criteria are achieved:

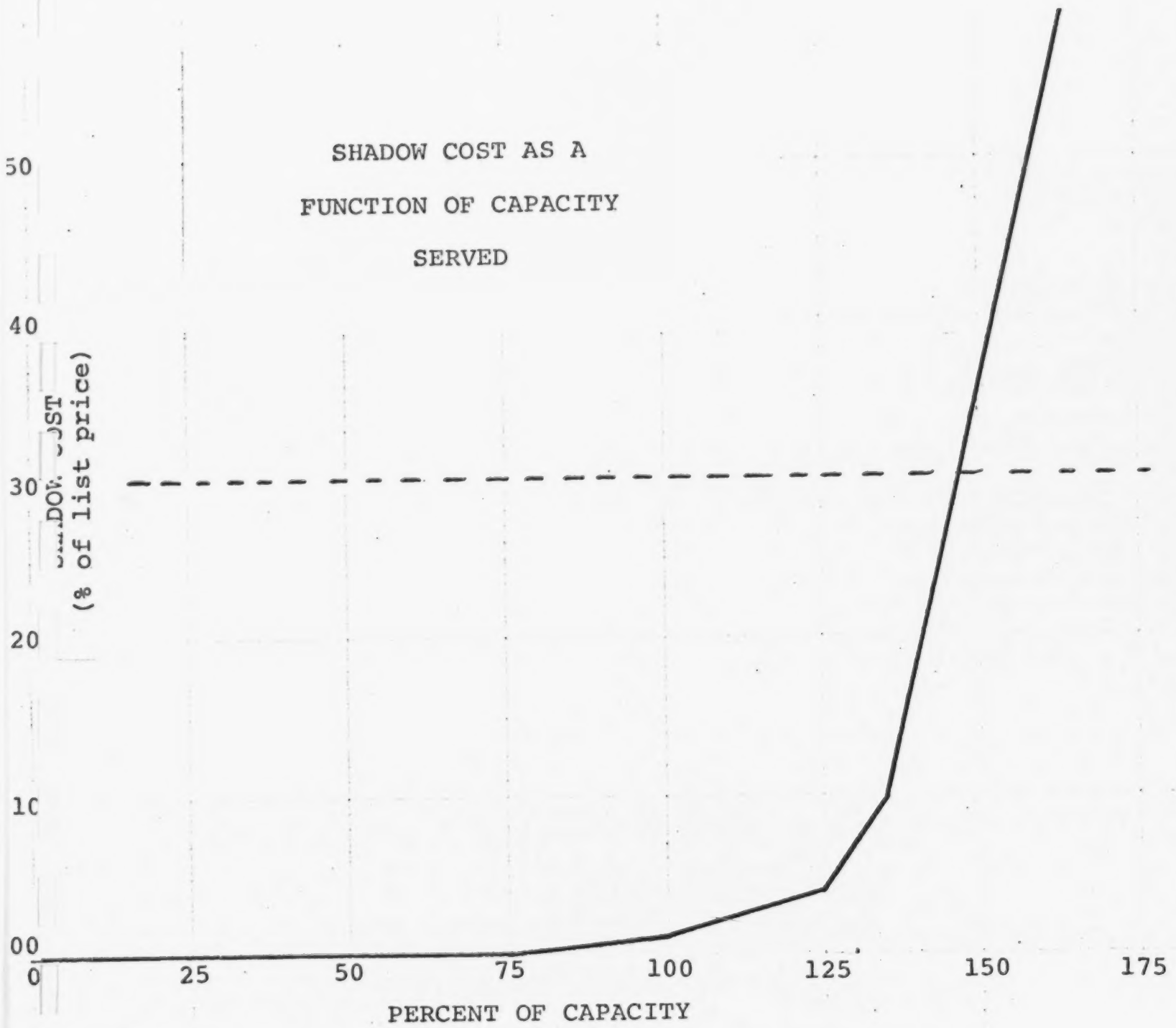
1. Government buyers that have a contract with a BG or BS establishment are the first customers assigned to that establishment. (In fact, the government buyers will shop at an establishment despite the price charged and regardless of whether the establishment has any capacity.) Government buyers will not shop at local establishments unless there is a contract to do so.

2. Buyers are not discriminated by the order in which they are assigned to commercial establishments, but as a result of over-capacity bias -- consumers of large amounts of capacity will tend to be re-assigned first from over-crowded establishments.

3. The bias against shopping at crowded establishments is reflected in shadow costs assigned to the price charged by each establishment as shown in the following graph.

4. Transportation costs for residences to shop at PG and PS are calculated for assignment purposes (see the diagnostics in the commercial output) but are not actually charged to the residence owners.

Figure 2


SHADOW COST AS A
FUNCTION OF CAPACITY
SERVED
50
40
30
20
10
00
(% of list price)
0
25
50
75
100
125
150
175
PERCENT OF CAPACITY

D. THE EFFECTS OF TIME ALLOCATION IN EDUCATION

The accompanying figure shows the relationship that exists between old education level, time spent in adult education (pay plus free), and new education level. The row headings are the old educational levels, the column headings are the time units actually spent in adult education (equal to or less than the time allocated to adult education), and the numbers in the table are the new educational levels.

Assume that a low income population unit had an old educational level of 20 and spent 40 time units in adult education. This would raise the educational level for that unit to 23 for the next round. Note that for that population unit, any time spent in adult education above 23 units would raise the educational level and any time spent less than 18 would lower the educational level. Also, note that when a PL reaches its highest educational level of 39, it must continue to spend at least 30 units of time in adult education to maintain that educational level. Similarly, PM's must spend at least 24 time units to maintain their highest level of 69, and PH's must spend at least 32 time units to maintain their highest level of 99.

Educational levels are very important in the employment process; therefore, if a social decision-maker is satisfied with the educational levels of his Pl's, he should realize how much time must be spent in adult education to simply maintain the present levels. The following educational levels require the indicated amounts of time spent in adult education to just maintain the educational level:

Educational Level	Time Units
0	0
10	12
20	18
30	24
40	0
50	12
60	18
70	0
80	16
90	24

New Educational Level as a Function of Old Educational Level and the Amount of Time Actually Spent in Adult Education

OLD EDUCATIONAL LEVEL		TIME UNITS															
	LEVEL	0	6	8	10	12	16	18	20	24	30	32	36	40	42	48	50
PL	0	0	0	0	0	1	1	2	2	3	4	4	5	5	6	7	7
	10	9	9	9	9	10	10	11	11	12	13	13	14	14	15	16	16
	20	18	18	18	18	19	19	20	20	21	22	22	23	23	24	25	25
	30	27	27	27	27	28	28	29	29	30	31	31	32	32	33	34	34
	39	35	36	36	36	36	36	37	37	38	39	39	39*	39*	39*	39*	39*
PM	40	40	40	40	40	41	41	42	42	43	44	44	45	45	46	47	47
	50	49	49	49	49	50	50	51	51	52	53	53	54	54	55	56	56
	60	58	58	58	58	59	59	60	60	61	62	62	63	63	64	65	65
	69	66	67	67	67	67	67	68	68	69	69*	69*	69*	69*	69*	69*	69*
PH	70	70	70	70	70	70	71	71	71	72	72	73	73	74	74	75	75
	80	79	79	79	79	79	80	80	80	81	81	82	82	83	83	84	84
	90	88	88	88	88	88	89	89	89	90	90	91	91	92	92	93	93
	99	96	96	97	97	97	97	97	97	98	98	99	99	99*	99*	99*	99*

* Income class maximums cannot be exceeded.

NOTE: The column headings (time actually spent in adult education) are listed in such a way that all points at which the educational level changes are indicated. For example, for a P1 with an initial educational level of zero, an expenditure of 12 time units in adult education is required to raise the new educational level to one. The expenditure of from 13 to 17 time units by this P1 would still only raise the old educational level to one. An expenditure of 18 time units is required to raise the new educational level to two.

E. BUS AND RAIL COMPANY OUTPUT

This explanation is intended to supplement the output description given in the Players' Manual.

Financial Report

1. Capital Expenditures - Vehicle Purchase: If units of equipment are sold, an amount equal to .50 X Average Value Ratio X number of units sold X $10,000 is credited as a negative figure under vehicle purchase.

2. Current Income - Fares: This figure is the sum of the yearly fares paid by each employee that uses the bus to travel to work (see Employment Detail). The fare charged by the company is for a single worker-trip; the yearly amount is calculated based on two trips per day, five days per week fifty weeks per year (i.e., single trip fare times 500). As the yearly fare per worker is automatically expressed in tens of dollars, the total fares printed out may be somewhat less than the number that would be derived by carrying more significant figures. [This is true only for the regular scale (P1 = 500 people); the figures for the small scale (P1 = 50 people) should be exact.]

Employment

1. As the Bus and Rail Companies hire employees (PM's) in groups of 160 workers, it is in the companies' interest to keep the total combination of service level and route lengths such that "Personnel Required" is equal to or slightly below a multiple of 160. For example, if 328 personnel are required, three PM's would be requested and paid for although only slightly more than 2 PM's would be utilized. Personnel requirements can be calculated using route miles and level of service (see Players' Manual).

2. All government and quasi-public companies which hire employees (SC, MS, BUS, RAIL) have the same fixed transportation cost for a given class. This fixed cost is the average travel cost and time for non-government workers in each class. Dollar cost differs by class but time is the same and both are recalculated each round. If BUS and RAIL are not successful in hiring any workers, the systems will not carry any passengers.

Rolling Stock

Units Owned is the total number of equipment units owned by the company; purchase of sales of equipment are shown here.

Units in Use is equal to the units required up to a maximum of Units Owned; Units in Use is the number of equipment units which undergo depreciation.

Serviceable Units is Units Owned times the Average Value Ratio/100.

One of the considerations entering into the passenger capacity of a route is the "effective" number of units/mile operating on that route (employment and level of service are the other considerations). Each mile of level one route has a requirement of 40 equipment units for full capacity. The total requirement for the system is summed under Units Required. The actual number of units used is the lesser of Units in Use or Serviceable Units. For example, if the units required is 400 and there are only 200 serviceable units, then the passenger capacity is half of the desired capacity of the system.

Passengers

The number under Total Passengers includes transfers from one route to another which is done at no cost. Therefore, they are not all full paying passengers on that route. Passengers who transfer between modes pay costs for each mode. That is, a worker who drove to a bus station, took a bus to a rail station, and took the rail to his place of employment would pay an auto cost and separate fares to the Bus and Rail Companies.

In order to economically carry passengers, Bus and Rail routes must take Pl's from where they live (or from where they can economically drive to where they work. Thus, it is important both that the routes have stops (or stations) in many residential locations (and in higher residential density locations) and that the routes provide access to a number of work locations. It would be very uneconomical to have a long winding route through low density residences terminating near only one or two employment locations. (Typical cost/mile and break-even fares are noted in the Master Tables.) As mentioned in the Players' Manual, the routes are directional and are specified to carry workers from residences to their employment location; if a route is specified A⟶B⟶C⟶D, the route would not carry passengers from C to B. A new route C⟶B would have to be specified.

Routes

This portion of the output indicates by route where the bus or rail stops, how many passengers got off at that stop, how many got on, and how many passengers are riding between stops. This information indicates what portions of a route are underutilized and which are overcrowded and

thus should affect decisions involving extending, deleting, or upgrading a particular route. The figure for Total Passengers under the transit summary is the sum of all passengers riding the given route, not their distribution; i.e., a route (level 1) may have 9000 total passengers, but yet be distributed in such a manner that no segment of the route is overcrowded. Data on which segments are overcrowded would come from the Routes output. If a route is highly overcrowded in one round, the computer will probably assign a much lower ridership the following round.

Additional information for each Pl on where they live, where they work, and mode, route and cost of transportation is given in the Employment Detail. The game director may want to withhold the Routes portion of the output from the Bus and Rail Companies and charge them (Cash transfer to outside) a consultant's study fee for the information.

Transportation Network Maps (2 copies each of 2 maps)

It should be noted that the map which includes residences (R) and work locations (W) shows land use only. The map does not indicate either density or class of workers on a residential parcel or total number or class of jobs on an employment parcel. Business type can be obtained from the Economic Status Map, population is shown on the Demographic Map, and the class of Pl's is shown on the residence output of the economic decision-makers.

On the page following the last Transportation Network Map there is a printout of the list of Rail track segments and Rail Stations. This page should be given to the Rail Company along with one copy of each type of the transportation network maps (the other set going to the Bus Company). This is the only place where a complete list of track and station locations is printed.

F. THE $REDIST INPUT

The $REDIST input decision may be used by both the municipal services and school departments of each jurisdiction. The inputs may be ordered haphazardly within the list of inputs because they are not analyzed by the EDIT program until all inputs have been read.

After the end of the input decisions, EDIT sets up a dummy board in which it compares the original districts with the specifications offered by any new inputs. Of course, this is done only for those departments and jurisdictions which have submitted redistricting decisions. Not only do the new inputs have to be consistent and meet the contiguity constraint, but also the new inputs in conjunction with the previous district allignment must meet all constraints.

New inputs overlay control and boundaries. That is, it is sufficient to include a parcel which was previously served by a different plant or school (for illustrative purposes, the plant at 9632) as being in a new district -- the district for 9632 does not have to be redefined.

Note player input mistakes which invalidate their whole set of redistricting decisions:

a) crossing a jurisdiction line

b) attempting to relist a parcel on which there is a plant

c) cutting off service which had previously existed to some distant parcels with a new plant

d) failing to meet contiguity with the inputs themselves.

The players should be reminded that if any error is made in any one of their redistricting inputs, the entire set of redistricting for the department in a particular jurisdiction will be rejected.

G. GOVERNMENT CONTRACTS WITH BG AND BS ESTABLISHMENTS

The school and municipal service departments from each jurisdiction will not purchase any of their business goods and services from local establishments unless they submit a contract input. This input offers flexibility in the amount of goods or services the department can acquire from different local BG's and BS's. For each local establishment (regardless of its jurisdiction) with which a department wishes to contract, it must specify the desired percentage of total purchases, the priority that the new contract is to have with respect to other current contracts, and the priority that the displaced contract (if any) will have. Priorities are pertinent in a situation in which the total specified percentage exceeds 100.

For example, assume that in year "t" the School Department in jurisdiction one wanted to purchase 50 percent of its goods from A's BG1 at 10044, 25 percent from B's BG2 at 9830, and 25 percent from G's BG1 at 9228. Prior to year "t" there were no contracts. Furthermore, the department wanted to give G's contract priority over B's contract, and B's contract priority over A's contract. The School Department decision-maker should submit the following input.

```
$CVPT/=SC1/C,9228,25,1,0,G
      /C,9830,25,2,0,B
      /C,10044,50,3,0,A
```

Assume that in the following year (t + 1) the department decided to replace the purchases of 25 percent of its needed goods from team B with purchases of 40% of its goods requirement from team E's BG1 at 9436. The new contract is specified as having the same priority. The input would be

```
$CVPT/=SC1/C,9436,40,2,2,E
```

This means that team E's BG replaces team B's BG on the contracts list, and now only 35 percent is purchased from team A because the sum of the percentage allocations exceeds 100.

Other cases and sample inputs follow:

Case 1. Round t - 1: MS1 has one contract for 100% with E's BS at 9632.

Round t: MS1 desires to contract for 50% with F's BS at 10030 at top (first) priority and purchase the other half of his needs at the original contractor.

Input: $CVPT/=MS1/C,10030,50,1,2,F

Case 2. In Round t + 1, MS1 chooses to eliminate both of these contracts.

Inputs: $CVPT/=MS1/C,10030,50,0,0,F

C,9362,100,0,0,E

H. THE EFFECTS OF THE OUTSIDE SYSTEM

Together, the game director and the computer represent the Outside System. The major components of the Outside System are:

1. Business Cycle -- affects prices paid for basic industry output, the return on investments in stocks, and the interest rate on loans and bonds involving the Outside System.

2. Federal-State Aid -- affects the amount and type of aid that local government departments and economic teams may receive.

3. Federal-State Taxes -- affects the taxes that leave the local system.

4. Migration -- affects the movement of people (Pl's) into and from the local system.

5. Auction and Bids -- affects the chances of teams or departments acquiring land that is presently owned by Outside interests.

6. Construction Industry -- affects the price of construction and demolition of land uses by outside firms.

7. Suppliers of Goods and Services -- affects the price at which all goods and services may be purchased from the Outside.

The different components of the Outside System will be described in the order listed above. Director influences and relevant computer output will be noted.

1. Business Cycle

a. Basic Industry Prices

The business cycle in the CITY III model follows the pattern shown in Figure 1. Note that the variation in HI average prices is greater than that for LI which is, in turn, higher than that for NS. To calculate the price received per unit of output for any basic industry in the local system, multiply the normal price per unit for that type of basic industry times the business cycle index for that basic industry. For example, the price per unit of output for an HI in Round 2 would be $190,000 x 1.08 = $205,200.

b. Loan and Bond Interest Rates

The basic outside loan rate is also related to the national business cycle. The interest rate shown in Figure 1 is used as an average when the actual interest rate on each loan is calculated.

In order to determine the interest rate on a specific loan from the Outside, the computer generates a random number between 1 and 1024. Depending on what the random number is (see Table A, page 23), a percent is added to or subtracted from the average interest rate for the round, as shown in Figure 1.

FIGURE 1

BUSINESS CYCLE

Edits Before Round:	Output For Round:	Outside Loan Mean Interest Rate (%)*	Basic Industry Ratio of Price Per Unit Output To Normal Price			Percent Return on Investments (Mean)	
			HI	LI	NS	Conservative	Speculative
1	24	5.1	1.05	1.04	1.03	6.1	8.9
2	1	5.2	1.08	1.07	1.05	6.3	9.2
3	2	5.7	1.07	1.07	1.06	6.2	4.7
4	3	5.3	1.03	1.04	1.03	6.1	8.7
5	4	5.1	.99	1.00	1.01	5.9	4.0
6	5	4.8	.93	.97	.98	5.4	-1.5
7	6	5.0	.95	.98	1.00	6.0	6.3
8	7	5.2	1.00	1.02	1.02	6.1	8.5
9	8	5.5	1.02	1.03	1.04	6.3	7.0
10	9	5.9	1.06	1.04	1.05	6.7	1.0
11	10	6.2	1.07	1.04	1.04	6.5	8.5
12	11	6.1	1.02	1.01	1.02	6.0	3.9
13	12	5.4	.98	.99	.99	5.7	-1.0
14	13	5.0	.94	.96	.97	5.8	5.9
15	14	4.7	.90	.93	.95	5.1	7.0
16	15	5.1	.97	.98	.99	6.0	9.3
17	16	5.4	1.01	1.02	1.01	6.3	6.5
18	17	5.9	1.07	1.07	1.05	6.7	2.1
19	18	5.8	1.12	1.10	1.05	6.4	4.9
20	19	6.0	1.10	1.08	1.04	6.5	8.3
21	20	5.3	1.02	1.05	1.01	7.0	7.5
22	21	4.7	.97	1.00	1.02	6.5	9.5
23	22	4.3	.95	.97	.99	5.4	7.3
24	23	5.1	1.00	.99	1.01	6.0	6.4

*The mean interest rate on government bonds is 2 percent below the mean outside loan rate in a given round.

TABLE A

Random Number	Value to be Added to Mean
1	- .5
2 - 11	- .4
12 - 56	- .3
57 - 176	- .2
177 - 386	- .1
387 - 638	0
639 - 848	+ .1
849 - 968	+ .2
969 - 1013	+ .3
1014 - 1023	+ .4
1024	+ .5

The interest rate on government bonds is determined in the same fashion, except that the average is 2% less than the average outside loan interest rate and the values associated with the random numbers are half of the loan values.

Because the round number is incremented during output, all interest rates calculated during the EDIT routine will use a different average from those calculated during output. This difference is apparent only for the interest rates on government bonds. For example, capital bonds which are floated as inputs to round 3 have an average interest rate of 3.7%. A current bond floated during the simulation executed to produce Round 3 to cover a department deficit would have an average interest rate of 3.3%. (See Figure 1.)

c. Return on Conservative and Speculative Investments

The average return on conservative and speculative investments is the same for each team in a given round, but a standard value (described in the Players' Manual) is applied to that average for each team. The standard value applied is derived from a table similar to, but with wider diversity than, Table A above. For example, in Round 2 one owner of conservative stocks may have the value of his investments increased by 6.3 percent (the average) but another owner may have his increased by 8.0 percent.

2. Federal-State Aid

Two government departments (SC and MS) receive federal-state aid automatically for certain current programs. The School Department receives $225 per student enrolled in public schools and the MS Department receives two federal-state aid dollars for every local dollar spent on welfare, up to the limit that federal-state aid may not exceed $35 times the local jurisdiction population. These departments need not apply for this aid, as they receive it automatically.

Three government departments (SC, HY, and PZ) may request and receive federal-state aid for capital projects. These departments must match the federal-state aid received with specified amounts of their own funds. Each aid request for a capital project has a specified probability of being funded in a given round. These conditions are summarized below:

Dept.	Project	Maximum Number of Requests	Matching Ratio (F-S to Local)	Probability
SC	Build or Upgrade Schools	3	1:1	.60 for first request .40 for second request .30 for third request[a]
HY	Build HY1 Build HY2 Build HY3	30 road segments in total[b]	1:9 1:1 2:1	.80 .50 .30
PZ	Purchase Land	3	N/A	.15[c]

[a] The probability increases as the jurisdiction public school enrollment averages more than 18,000 per school, and decreases as the average enrollment is less than 18,000.

[b] Or five separate Federal-state aid requests, whichever comes first.

[c] The probability decreases with the amount requested and as the population per square mile of parkland exceeds 100,000 persons.

A department that receives federal-state aid may spend that aid in the following round or any round thereafter. In other words, the aid is granted and the department can spend the aid whenever it pleases. In the case of SC and HY, the aid must be spent on the specific construction project for which it was requested. For example, if the proposed SC1 at 10842 received the federal-state aid, the aid can only be used for that specific proposed school. The federal-state aid for PZ is not tied to a particular location. Therefore, it can be used to purchase parkland or PI anywhere in the system.

The game director may at his own initiative or in response to player requests, develop any new federal-state aid program by using his $CASH prorogatives, i.e., he can input cash to any economic or government account. This option has been used on many occasions to simulate such federal programs as Model Cities, Urban Renewal, Low Cost Housing Support, Mass Transit Demonstration Grants, Small Business Administration, Labor Department Training Grants, etc.

3. Federal-State Taxes

a. Federal

Federal personal and business income taxes are paid by local system population units and businesses. The federal income tax rates are:

Taxpayer	Rate
PH	12% of employment income
PM	6% of employment income
PL	3% of employment income

Businesses

Of first $25,000 net income	22%
Of remainder of net income over $25,000	48%

These federal tax rates do not change during the play.

b. State

State sales taxes are paid by all private purchasers of goods and services whether the selling establishment is in the local or Outside System. The state sales tax is fixed at 3% of total expenditures for goods and services.

4. Migration

The game director has the option both of choosing one of two methods of migrating Pl's and of directly affecting migration results by specifying the number of in-migrants by class. The details of the migration module are explained in section J of this Appendix. With respect to the Outside System, however, it is important to recognize that the people moving in and out of the local system also operate within a larger national system. That is, to the extent that the local system attracts on the net migrants from the Outside it will grow at a faster rate than natural population growth alone would allow. Conversely, if local conditions are such that there is a net out-migration from the local system to the Outside System, then the local population will stabilize or decrease depending upon the extent of the out-migration.

5. Auction and Bids

Local system decision-makers are dealing with the Outside System any time they make a bid to purchase a piece of land that is not owned by someone in the local system. The value of the land owned by the Outside System is calculated by using a formula that takes into account the location of the land with respect to terminals, residences, employment and road access. The formula also takes into account the zoning of the parcel and whether or not it has utility services. More specifically, the value of a computer-owned parcel is calculated so that:

Each round, six outside-owned parcels are selected randomly to be auctioned to the highest bidder. The value of outside-owned land is determined each round from:

PRICE -- which equals the full market value of an outside-owned parcel

VALUE -- which equals the average for 100% value for 100% of privately owned and undeveloped parcels (a minimum of $64,000)

POINTS -- which equals the sum of the parcel's points as described below

PRICE -- which equals $\frac{\text{value X points}}{50} + \frac{\text{value}}{15}$

For each parcel, points are calculated on the following scale:

Distance to nearest terminal (miles):

Distance	0	1	2	3	4	5	6+
Points	45	40	35	30	25	20	5

Distance to nearest residence (miles):

Distance	0	1	2	3	4	5	6+
Points	18	15	12	9	6	3	0

Distance to nearest employment (miles):

Distance	0	1	2	3	4	5+
Points	25	20	15	10	5	0

Utilities: 20 points if present; 0 if not

Zoning Classification:

Zoning Code	10's	20's	30's	40's	51	52	53	60's
	25	20	20	15	3	6	12	0

Road Access:

For each road which enters an intersection at a corner of the parcel but does not border the parcel (a maximum of 8 roads).

Road Level	1	2	3
Points	1	2	3

The probability of a bid being accepted depends upon the amount of the bid in relation to the value of the land as calculated by the land value formula, competing bids, and the type of bid (an auctioned parcel or an unsolicited bid). The probabilities and computer procedures for land bids are described in Chapter V, Section B of the Players' Manual.

6. Construction Industry

The game director controls the construction module in that he may determine whether or not local construction industries will be employed in a play. Use of local CI's also means that a year time lag for construction is in effect and that the cost of outside construction becomes 130 percent of normal construction costs.

Several land uses can be constructed only by outside firms. These are:

CI	=	$120 m
UT plant	=	$ 30 m
Rail Station	=	$ 1 m
Surface Rail Track	=	$ 4 m/mile
Underground Rail Track	=	$ 14 m/mile

The remainder of the land uses may be constructed by either local or outside construction firms. When CITY III is being played without local CI's, development costs for outside construction are equal to typical costs. When local CI's are being employed, then outside construction costs are 130 percent of typical costs.

7. Suppliers of Goods and Services

Some goods and services are purchased only from the outside:

a. BG and BS requirements (regular plus maintenance)

b. Bus and rail rolling stock (purchase and maintenance)

c. Highway maintenance

d. Utility service to parcels (and operating costs)

e. All transportation and terminal expenses

The purchase of other goods and services are made either from local firms or from the outside depending upon the capacity, prices and location of local establishments; boycotts on the part of the consumers; transportation access; and contractual shopping agreements.

Since Outside System prices are fixed (at 130 percent of typical inside prices), the Outside firms offer an effective upper limit on the price that can be charged by local monopoly or colluding firms. Whereas all local firms have finite capacities to sell goods and services, the Outside System has an infinite capacity in so far as the demands of the local system are concerned.

I. BUSINESS PROFITABILITY

The Master Sheets for economic developments show profitability (typical rates of return and breakeven points) for the various land uses. These are provided so that economic decision-makers will have some idea of the annual return that is possible from different investment decisions. The rate of return is the percent of development cost that is earned each round (net income) by a development assuming certain conditions. The breakeven point is the capacity at which a commercial development must operate in order to cover the fixed and variable costs of staying in business.

Basic Industry

In calculating estimated net incomes, many simplifying assumptions were made. "Typical" prices for the output of the three basic industries were: HI1 - $190,000 per CU; LI1 - $115,000; and NS1 - $110,000, assuming a value ratio of 100 and satisfactory employment requirements. The wage bill, purchases from BG and BS, and utility charges were assumed to be at typical prices.

Transportation, depreciation, taxes, and amortization payments can vary over a wide range. To obtain estimates of this group of annual expenditures, the following assumptions were made: that the travel distance was two miles to the assigned terminal and BG and three to the BS, using per mile travel costs for an HY2; that a municipal service plant with a use index of 110 was used to account for the effect of municipal service quality on depreciation; that the entire construction cost (a "typical" figure) was entirely financed by a loan at an interest rate of 5% to calculate the amortization payment; that the assessment ratio was 50%, the property tax 3% and the corporate income tax 50%.

With these assumptions, the rates of return obtained were 26% for HI, LI, and NS. These rates represent a sort of "typical average maximum rate of return". That is, it is a rate of return a businessman could expect if all prices were at their typical values, the business cycle was at its average value, and all other variables were at their typical, average or normal value.

Commercial Business

For commercial enterprises other simplifying assumptions were necessary. Typical prices per CU of output were assumed: BG and BS = $100,000 and PG and PS = $10,000.

Each enterprise was assumed to be operating at 80% of design capacity. In terms of CU's sold this is: BG = 4000, BS = 1200, PG = 12,800, and PS = 6400. Costs such as the wage bill and utility charges are constant for industries; whereas purchases of goods and services vary with output, but the relationship is a linear one and therefore easily calculated. The same assumptions were made for commercial enterprises as for basic industry with regard to transportation, depreciation, amortization payments and taxes. The rates of return obtained were: BG = 29%, BS = 41%, PG = 29% and PS = 37%. In this case the rates represent some sort of typical return under fairly ideal circumstances. The variability of the rate of return for BS and PS is considerably greater than for BG and PG (as a function of CU's sold). The breakeven point in terms of CU's sold, for each business type (on the above assumptions) was: BG = 2800 (56%), BS = 1065 (71%), PG = 9050 (57%), and PS = 5600 (68%).

Construction Industry

For the construction industry the assumptions above hold except that the wage bill is not constant; rather, it varies proportionately with the amount of capacity used. The construction industry pays the costs of transporting equipment to the building site, in addition to the transportation cost to BG and BS. The average distance from construction industry to building site was assumed to be 5 miles. With the construction industry operating at 80% capacity, the rate of return was calculated to be 22%, and the breakeven point was 250 capacity units (25 percent capacity) under fairly ideal circumstances.

Residences

With regard to residences, the relevant assumptions are that the residences are occupied at design capacity. Typical assumed rents paid by the three income classes are: high - $330,000, middle - $200,000 and low - $140,000 per population unit. Construction cost of residences at QI of 100 are set at: RA - $1 million, RB - $6 million and RC - $25 million. Construction costs do not, however, decrease proportionately to the QI; rather they decrease half as fast (see note in Master Sheets for Residence). Rates of return vary depending on the income class for which the residence is built (assuming that the desired income class actually becomes the resident income class).

J. THE MIGRATION PROCESS

Migration is run separately for each class in the order of high, middle, low. Pl's categorized as immigrants in either of the two versions assume certain characteristics as described in Table B.

When a Pl moves into a residence, its characteristics are averaged with those of the inhabitants in its class and it takes the same preferred allocation as the previous residents. If a Pl moves into a residence which was previously unoccupied by its class, its characteristics and preferred time allocation are the same as they were at its previous residence location, or, in the case of new in-migrants, the characteristics and preferred time allocations shown in the table below.

TABLE B

	CLASS		
Time Allocation Units	PL	PM	PH
Extra Job	40	30	20
Free Education	20	30	0
Pay Education	0	5	20
Politics	10	20	40
Recreation	20	10	10

If more than one Pl moves into a housing unit previously unoccupied by that class and the Pl's have different characteristics (come from different locations), the characteristics of the Pl's comprising a plurality of the in-migrating Pl's are assumed for all the Pl's. If two groups of Pl's tie for being the most numerous, a random choice is made as to which group's characteristics are assumed to hold for all the Pl's on the parcel of that class.

Characteristics	PL	PM	PH
Education Level	15	55	85
Voter Registration	100	140	200
Previous Savings	0	0	0

A Pl which moves from one place inside to another keeps its previous job location. Although its previous job may not turn out to be its best job after the move, there is a bias toward retaining the previous job.

There are five groups of people looking for housing:

1) Most dissatisfied in the System. A randomly-selected half of the 20% most personally dissatisfied Pl's living on the board move out of their previous housing. The random selection is made not Pl by Pl but by employment group (all of a class on a parcel who work at one place).

2) Randomly Chosen in the System. Of the other 80%, a random 1% of PL's, 5% of PM's and 7% of PH's will leave their current housing.

3) Natural Population Growth. 1 1/2% of the total population of each class is added to the in-migrant pool in order to represent natural population growth.

4) In-Migrants. The number of in-migrants in any class is 5% of the number in the class in the local system plus a number equal to the number of jobs in that class which were not filled last round.

5) Displaced People. All people who lived on parcels on which all residences have been demolished look for new housing. The residents on a parcel on which only some of the housing has been demolished are not specifically selected to look for new housing.

No Pl's are initially selected to out-migrate. Those in groups (1) and (2) who cannot find acceptable local system housing* with a housing dissatisfaction index below their previous housing dissatisfaction index will out-migrate, as well as those in groups (3), (4), and (5) who cannot find acceptable housing.

The list of Pl's looking for housing is randomly ordered. Each Pl takes the best (lowest housing dissatisfaction) acceptable available housing. If the best housing would be over 120% crowded if the Pl were to move in, the Pl looks at the second best acceptable housing. If a Pl cannot find housing which meets its criteria, it will out-migrate.

Housing Dissatisfaction

Dissatisfaction with housing is calculated using the following factors: local tax rates (resident income, personal goods, and land), the welfare payment per unemployed

*Acceptable housing is housing with a QI ranging from 20 to 70 for low, 40 to 100 for middle, and 71 to 100 for high and under 120% occupancy.

worker, the quality indexes of the MS and school serving the parcel, the rent charged at the residence, and the quality index of the residence. Personal dissatisfaction combines housing dissatisfaction with indexes derived from salary earned last year and time spent in each activity and is done for each Pl.

The calculation of housing dissatisfaction is performed in the following manner:

Add: a factor for the quality index. This factor increases severely as the quality index decreases, and equals 100 if the QI is 0.

Add: about 1.5 points per $1000 in rent which is above "typical" for the class (PL - 135,000; PM - 150,000; PH - 160,000). This factor cannot be negative.

Add: 1 point for every increment above 100 in the MS use index. This factor cannot be negative. (Maximum is 100)

Add: 1 point for every point in the school quality index above 100. This factor cannot be negative. (Maximum is 100.)

Add: (for PM and PH only) 3 points for every mil in the resident income tax rate, 1 point for every mil in the goods tax rate, 1/10 point for every mil in the land tax rate.

Add: (for PL only) a maximum of 10 points, which decreases as welfare payment per unemployed worker approaches $2200.

Personal Dissatisfaction

To calculate personal dissatisfaction:

To housing dissatisfaction:

Add: for every $100 earned below $2600 for low, $5200 for middle, $10400 for high*, 10 points for low, 6 for middle, 3 for high.

*Salary factors are in per worker terms; there are 200 workers in a PL, 160 workers in a PM, and 120 workers in a PH.

Add: For each time unit not spent in requested (preferred) activity:

1/2 point if part-time work or free education

1/5 point if politics or recreation (this time is always allocated unless transportation time is much higher than expected and causes reduced recreation and politics allocations.

Add: 1 point for each time unit spent traveling to work.

The director may use his control over the absolute number of in-migrating population units by class to override the in-migration portion of the computer.process just described. This director influence is explained in Chapter II.

Summary

COMPONENTS OF HOUSING DISSATISFACTION

	Points in Migration
Housing Quality Index	
80	35
50	77
20	95
0	100
Rent	
for each $1000 above "typical" (135K, 150K, 160K)	1.5
MS Use Index	
for each point over 100	1
School Quality Index	
for each point over 100	1
Tax Rates (PM and PH only)	
each mil resident income	3
each mil goods	1
each mil services	1
each mil land	1/10
each mil development	0
Welfare (PL only)	
for each $100 below $2000	4

COMPONENTS OF PERSONAL DISSATISFACTION

	Points Toward Dissatisfaction in Migration
Housing Dissatisfaction (see preceding chart)	
Personal Employment for every $100 earned below specified amount ($2600, 5400, 10400)	10-PL
	6-PM
	3-PH
Time Allocation for each time unit <u>not spent in</u> requested activity:	
part-time work	1/2
free adult education	1/2
politics	1/5
recreation	1/5
for each time unit <u>spent in</u>:	
transportation	1
involuntary	0

SELECTION OF MIGRANTS

	Number of Pl's
Most Dissatisfied	random 1/2 of 20% most dissatisfied
Displaced	residents of demolished housing
Randomly Selected	1% of PL's, 5% of PM's and 7% of PH's
Natural Growth	1.5% of each class
In-Migrants	5% of each class plus 1 Pl per job not filled last round

APPENDIX H

OPTIONAL GAME FORMATS AND SUGGESTIONS

As described in Chapter II there are a number of areas for variability in the game format of City III. This appendix will serve as a further extension of those formats. It should be emphasized that these role descriptions are guidelines intended as an exemplary framework from which the game director can focus specific issues and applications relevant to a particular group or play.

1. Mass Media

This role performs a communication function presently absent in the formal structure of the model. In a game-room context the Mass Media would control and use blackboards, a public address system or podium, copying machines for leaflets, etc. Responsibility for this role is analogous to that of a newspaper, radio station, or television station in the community. Indeed, depending on the size of the group playing City III , it may be desirable to have competing newspapers and television stations that vie for credibility and support from the game players, while exerting influence through advertizing, public notices, announcements, editorials and campaign speeches.

The Mass Media may be established in one of several ways. An open auction or closed bid,conducted by the game director, could award the Mass Media to the highest bidder. In this case, a bidder must have available cash to pay the auction bid price. Payment for the Mass Media would be accomplished by a cash transfer of funds from the successful bidder's account to the Outside System. Since social decision-makers have no cash transfer capability, they would have to propose imaginative arrangements to bring about a consortium of roles to manage the Mass Media. Another way to establish the Madd Media would be simply through designation by the game director. The Mass Media sets its own charges for "air time" and "newspaper space." These charges to users would be accomplished by cash transfer decisions.

2. Federal-State Aid Controller

This role performs a channeling and dispensing function for financial aid, presently handled in a probabilistic manner in the model. Responsibility in this role is analogous to that of a Federal or State Agency lending funds and granting assistance to municipalities on a shared or matched basis.

Since most funding for the municipal departments in City III is accomplished through the computer, this role could function as a "pork barrel" of federal funds to be distributed at the discretion of the F-S controller. These funds could be in addition to those requested via computer decisions. One basis upon which the departments would be eligible for funds could be through an application proposal to the F-S controller. Such applications, stating the need, objectives, and intended use of requested funds, could be reviewed by the F-S controller and funds could be allocated in accordance with a pre-determined goal or priority, or at the direction of the controller.

The F-S controller may be selected by the game director, voted in by the social sector, or hired from a series of applicants by the municipalities. Funds are made available for this role via cash transfers from the Outside System. Annual funds should reflect the status of the National Business Cycle, (i.e., upswing or downswing); or the game director may replicate stodgy congressional appropriations with funding cut-offs in certain areas, (i.e., no money for education, only for crime prevention through MS department). The game director should specify an upper limit for the F-S controller each round.

3. Data and Information Consultant:

This role allows advice and information retrieval to be profitable for an economic decision-maker or government department that chooses to accept the responsibility. With control of the employment and shopping diagnostics, along with land values, and summary data, this role has a "corner" on information useful but not essential to other game players. Thus, this role is analogous to an economic or social survey consultant offering analytical information (at a price) to government and business interests.

The Data and Information Consultant may be established through a bid or auction procedure similar to that described in the Mass Media. Once designated, the D & I Consultant is able to charge his own rates for consultation on data. These charges would be accomplished by cash transfer decisions, except in the Social Sector where information might be available free or for a non-cash charge such as traded votes, etc.

4. Alternative Forms of Government

There are numerous variations on a chief executive/ elected council that are available as a governmental form.

The structure of the model easily accommodates an elected mayor with no council, an elected mayor with council, an appointed city manager with or without council, or finally a council alone. Obviously, group executive decision-making has its drawbacks, but the council option may provide a useful lesson. When configuration of more than one jurisdiction is used, executive decision-making may be combined and coordinated, but departmental decisions remain bounded by jurisdictional lines.

This does not preclude an executive body similar to a Metropolitan Council of Governments with advisory and policy-making powers that affect member jurisdictions.

The chief executive (Chairman) in City III can be elected for a term of variable length, while the terms of councilmen may either coincide or overlap. Overlapping terms insures some continuity in the executive process which is useful in a gaming situation where players are initially unfamilier with many roles.

Since the chief executive in City III is elected by the population, he must run on a platform that appeals to a majority of voters. This platform can represent a spectrum of ideology from socialism to dictatorship.

5. Legal System

The City III game format can operate without a legal system, and does so on a default basis with the game director providing regulations as needed. However, over a number of rounds of play, it may be desirable to establish a formal set of regulation and laws (rules) by which the game players carry out their activities. Such a set of regulations may be termed the "Legal System." The legal system acts as the vehicle to enforce laws and regulations established by the council, and/or chairman through a judiciary and penal code.

A judge (or judges) may be either elected at large from the group of game players, or be appointed by the chairman or game director for a specified term (minimum of 3 rounds is suggested). A penal code can be drawn up during the first round (or pre-determined and ratified by the population units as a referendum). Thereafter, amendments may be drawn up by the judiciary, and approved by the council and/or chairman.

6. Insurgency

This activity, at the discretion of the game director, could be performed by any player willing to accept the potential consequences of punishment via the penal code. For instance, a player may decide to "blow-up" an industry which he and others are striking against for higher wages. The effects of this action will be borne out in future rounds for everyone to observe: loss of potential jobs, reduction of tax base, loss of investment, surplus of labor, lowered wages elsewhere, etc. "Blowing up" a development can be accomplished by submitting a demolish decision. The player(s) responsible for this decision must identify themselves to the judiciary and their subsequent escape or arrest will be determined on a random basis proportional to typical crime statistics. (i.e., rolling dice four times to obtain four 6's might mean escape, while failure to do so would subject the player(s) to the penal code.

The penal code might call for player "imprisonment" for 3 rounds with loss of 1/2 of his assets and all decision-making power. In the case of Social Sector players, there might be loss of voting rights, loss of jobs, and loss of decision-making ability. (Loss of jobs could be accomplished by submitting boycott decisions against primary employers in the system.)

7. Holding Corporations

This technique is fairly common in the business world, and allows several economic decision-makers to divide or combine assets for specific purposes. For instance, one economic decision-maker may "buy out" another and use the "bought" role as a finance company for making loans to other players; or perhaps all highrise housing may be combined, operated, and maintained under one "umbrella" corporation. Such a technique could demonstrate the effectiveness of "single purpose" corporations to the game players. Holding corporations can be set up by simply transferring assets and holdings to a vacant decision-making role.

8. Building Inspector

This role allows for a checking and inspection process of all developed facilities, especially dwelling units. Likewise all new construction might be reviewed and approved through the Building Inspector to insure that proposed projects meet minimum standards as expressed in value ratio, maintenance levels, conformance to master plan, etc.

The Building Inspector could be appointed by the game director or Chairman, or a member of the Planning and Zoning department could serve as Building Inspector in an ex-officio capacity.

9. Citizen Commissions

There are several bodies of representative citizens that may be implemented to focus on specific functions during play of City III

a. A Planning Commission, composed of citizen representatives elected from (pre-defined) wards, would serve a deliberative appeal and approval function, while the Planning and Zoning Department would serve as a staff function. Issues and policies would be directed from the Commission to be articulated in plan terms by the Department staff. The commission would be directly responsible to the population, while the department would be responsible to the commission, and to the Chairman. Ex-officio members could then be added at the discretion of the game director.

b. A School Board, composed of citizen representatives elected from each of the School Districts, whose functions would be analogous to those of the Planning Commission, but focused on matters of educational policy.

c. A Transit Commission, composed of citizen representatives elected at large, whose functions would be analogous to those of the Planning Commission, but focused on matters of transportation policy dealing with the Bus, Rapid Rail, and Highway Departments.

d. A Model Cities Commission, composed of citizen representatives elected from a designated neighborhood area. This commission would be a deliberative and action group responsible for attaining and implementing special funds made available for their "Model Cities Neighborhood." These funds would be in addition to the normal municipal funding via government departments, and could be available from the Federal-State Aid Controller.

10. Citizen Interest Groups

Informally, players may choose to organize the population units they represent in a number of ways to make their voices heard more effectively.

a. Ad Hoc Committees to focus on specific issues such as school quality, overpricing, housing quality, etc. could be made up of those decision-makers concerned enough about an issue to mobilize and act as a coalition.

b. Pressure groups might consist of decision-makers or population units with common goals and interests such as land-owners, people on welfare, purchasers of Business Services, etc. Such groups could develop a residual attitude and policy which would represent an identifiable force in the political process.

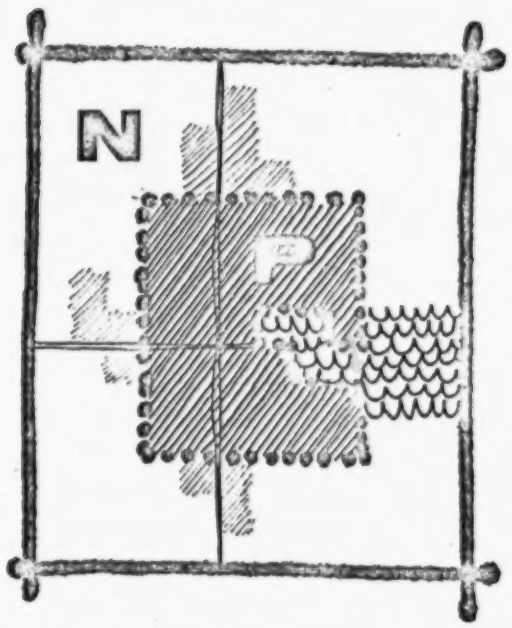
c. Unions might consist of low and middle income population units working at an HI plant, or perhaps a white collar union of high income workers at an NS establishment. These organizations could articulate the goals and desires of their constituency and be composed of a representative hierarchy.

d. Political parties could be formed by social decision-makers who would register their population units at the beginning of play based on a given philosophy for each party. Such a structure might encourage patronage in the Government departments along party lines and party ideology.

APPENDIX I

SCENARIOS FOR THE FIVE CITY III CONFIGURATIONS:
METROPOLITAN
TRI-CITY
MORAY COUNTY
DUNBEATH
LOTHIAN

METROPOLITAN SCENARIO



The city of PORTMOUTH is approximately 133 square miles in area with a population of about 1.03 million. The surrounding NAIRN COUNTY area (which encompasses 492 square miles) has a population of about 513,000 persons.

PORTMOUTH's downtown core, bisected by a bay inlet, is a concentration of commercial and industrial activity nearly a hundred years old.

Until 25 years ago, the downtown area was the focus of employment as well as residential and cultural activities. With its relatively slow population growth, it easily provided room for residential development close to downtown.

However, with the construction of the two rapid rail links extending to the north and northwest as well as a beltway and bay tunnel, a tremendous outward growth ensued. Lower density residential development blossomed on the fringes of the core area, particularly in the suburban NAIRN COUNTY.

Now, the metropolitan area has two satellite industrial centers, one to the north and one to the west of PORTMOUTH, in addition to an older commercial center in the county.

These suburbs have developed where two major highways cross, one of which has direct access to downtown core of PORTMOUTH. These "lifelines" of commuter traffic, more than adequate a few years ago, are choked with traffic. and congestion. This condition has given the suburbs further incentive to develop, in hopes of attracting a greater portion of the city's work force and consumer market. Even though they are all within the same county

jurisdiction, each of these satellite centers is distinctly different.

"Netherly," to the north, is a relatively high income, high quality suburb, with good residential service facilities and an industrial park.

"Wick," to the west, is a medium income, mediocre quality suburb with a good employment base but inadequate residential service facilities.

"Swordale," to the south, is a relatively low-income, low quality suburb with adequate residential service facilities, but with no employment base and relatively poor access to PORTMOUTH downtown core.

Although PORTMOUTH, with its central core of commerce and industry, has comparatively more job opportunities within its boundaries than many cities of similar size, an unemployment problem exists. Nearly 23% of its low-income workers are unemployed, while the county suburbs enjoy full employment.

In addition, the suburbs are growing more rapidly industrially and commercially than the city; jobs are moving outward with population. This poses additional problems to those workers in the city who cannot afford to commute to suburban employment or shopping.

Several recent actions by the city residents have set the tone for political relations between PORTMOUTH and NAIRN COUNTY.

Significantly, they voted to create a metropolitan transit commission. This transit commission, made up of representatives from both PORTMOUTH and NAIRN COUNTY, reviews the development and operation of the Rapid Rail and Bus Systems. The actual appropriations and funding responsibilities remain within the governments of each of the jurisdictions, however.

The rapid rail system, which presently offers fast economical access from "Netherly" to downtown has helped to maintain the livelihood of downtown businesses. But, the rapid rail is merely a linear connection between several points and not an efficient transportation network. The existing bus routes run largely independent of the rapid rail schedules. Thus, the appeal and effectiveness of public transportation is offset by lengthy rides to destinations. Even "close-in" PORTMOUTH residents drive to suburban shopping and employment centers to reduce frustration and travel time.

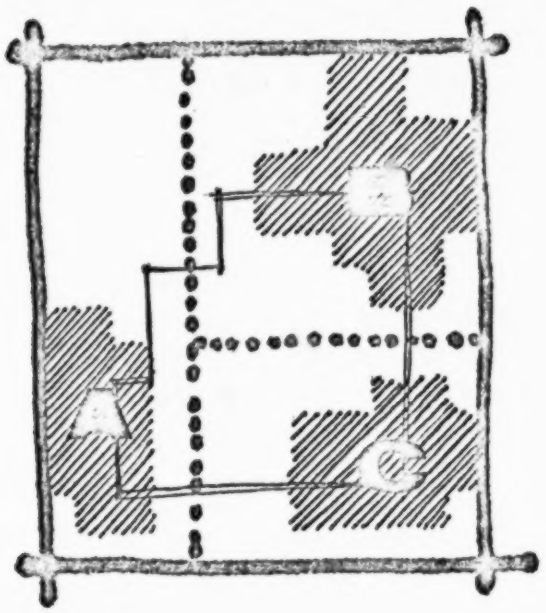
However, it was the hope of PORTMOUTH politicians, as well as many of its residents, that the further development of a coordinated and balanced transit system would reduce some of the intolerable automobile congestion and cause consumers to start shopping downtown again.

Another significant event was the defeat of a referendum to establish a county-wide joint school system. PORTMOUTH residents passed it overwhelmingly, but it lost by a wide margin in the county. The coalition of liberal upper class suburbanites and inner city residents expended their "political ammunition" on this campaign and felt that the climate for consideration of this issue would not become favorable again for many years.

The county's schools are in very good condition. They have high quality teachers at good salaries, and low student-teacher ratios which afford individual attention to each student. Their physical facilities are almost unsurpassed, since they are the beneficiary of recent advances in construction and educational technology.

PORTMOUTH's schools, on the other hand, are generally in poor condition. The old dilapidated facilities are difficult to modify and costly to improve, creating an atmosphere in which it is difficult to retain teachers or students. A high percentage of the students in PORTMOUTH attending costly private schools are an indication of the problem. On top of these problems, the PORTMOUTH school system has had only a meager budget to work with. Last year, an Ad Hoc Citizens Committee for Improved School circulated a petition calling for increased funding of school improvements. Sixty-six percent of the city's voting population endorsed the petition and it was on the mayor's desk two weeks before the primary election. His inaction on the petition proved to be his downfall in the primary where his opponent made an issue of school spending. He is now completing his term as a "lame duck" mayor, with the upcoming election to decide who will lead PORTMOUTH over the next several years.

TRI-CITY SCENARIO



Three separate cities comprise the tri-city area: AVIEMORE to the west, BO'NESS to the northeast, and CUMBERNAULD to the southeast. The three cities are interdependent to the extent that workers and goods flow between them, but they are independent as political entities.

AVIEMORE has a concentration of heavy industry, 60% of the total in the entire tri-city area. Its population of 200,000 people of primarily lower-income classes has a relatively high density (5300/sq.mi.) for a city of its size. Its industrial structures are dilapidated and one of its square mile parcels contains the worst slum in the area, whose inhabitants are among the poorest educated in the region. Even housing inhabited by middle and high-income groups is inferior to the housing available in the other two cities.

BO'NESS is an elite high-income town with only two light industries and two business establishments. Its population of 150,000 people has a relatively low density of 3600/sq.mi. Many high-income class workers take the commuter rail into CUMBERNAULD to work at the industrial and commercial enterprises located there. In the past there has also been some reverse commuter traffic of low-income workers from CUMBERNAULD to BO'NESS to work in the personal service firms there.

CUMBERNAULD is basically a middle-income community with a fairly even balance of heavy and light industry, and national services, and a sufficient component of local businesses. Its population of 250,000 people has a medium density of 4500/sq. mi.

Businessmen in AVIEMORE have been unwilling to hire local low-income workers because of their extremely low level of education. Instead, businessmen hire most of their low-income workers from CUMBERNAULD who travel upwards of 20 miles to their jobs. Consequently, there is

extensive low-income unemployment in AVIEMORE and even though the welfare payment per worker is only $600 per annum, the municipal services department is saddled with extremely large welfare expenditures.

A commuter rail line running into BO'NESS from the northeast and continuing on directly south into and out of CUMBERNAULD running parallel to the main highway connects these two cities, which are 19 miles apart. There are also main highways connecting AVIEMORE 24 miles to CUMBERNAULD, and 32 miles to BO'NESS. A regional airport lies on the northern outskirts of CUMBERNAULD.

In addition to the 135 privately owned developed or partially developed square mile parcels overall, there are also a large number of privately-owned, undeveloped parcels. Of particular note are the 16 square miles of completely vacant land owned by local businessmen lying between the three cities.

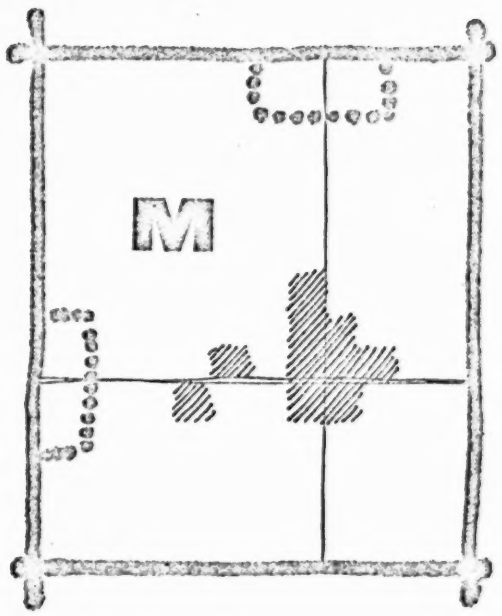
The quality of schools and other public services vary greatly among the cities. BO'NESS has provided its residents with exceptionally good schools and a large amount of parkland relative to the number of people served. Although there is no bus service, BO'NESS has maintained excellence among the remaining municipally supplied services.

CUMBERNAULD has generally maintained high quality public services, except for the section adjacent to and south of the industrial area. Here both the schools and municipal services have dilapidated physical structures and insufficient employees to fulfill the demands placed upon them. The amount of parkland has kept pace with the population growth and bus service is quite good.

In AVIEMORE the municipal government has shown itself incapable of meeting local demands. Even the schools and muncipal services in higher income neighborhoods are inferior and many high and middle income parents find it necessary to send their children to private schools. Bus service does exist, but the buses are old and break down so often there is never a full contingent on the road. The amount of new parkland provided has lagged behind population growth.

Together, the three cities of AVIEMORE, BO'NESS and CUMBERNAULD exhibit diverse settings, each with different sets of problems. Thus, appropriate remedies for each of the cities problems are not necessarily the same and very well may conflict with one another.

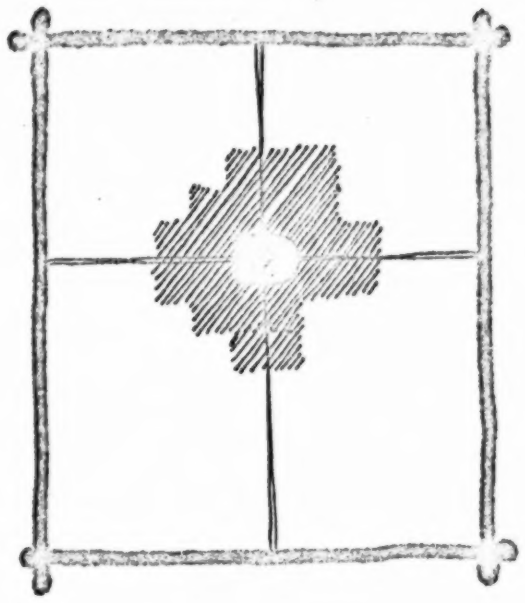
MORAY COUNTY SCENARIO



MORAY is a rural county with a population of 11,500, over half of whom are low-income class people. The only urbanized development is located at the intersection of two county trunk roads, one running north-south, and the other running east-west. About 2500 people make their residence near this intersection, while the remainder of the population is spread out along the two county trunk roads.

There are no on-going businesses of any kind in MORAY COUNTY, nor are there any industries. The only employers within the county are a municipal services plant and a school. Additional employment is available in two nearby cities, beyond the borders of MORAY COUNTY, one to the north and the other to the west. These two cities are separate jurisdictions over which local decision-makers have no control. Thus the present capacity of the government facilities to employ the residents of MORAY COUNTY is limited to the capacity of schools and municipal service plants in the county and the two adjacent cities. Future employment capacity will depend on MORAY COUNTY's ability to stimulate growth and development, success in gaining federal funds, and the extent of growth and expansion of the two adjacent cities. (It is suggested that the game director or a select group of players could operate the economic activities of the two adjacent cities via cash transfers from the Outside.)

DUNBEATH SCENARIO



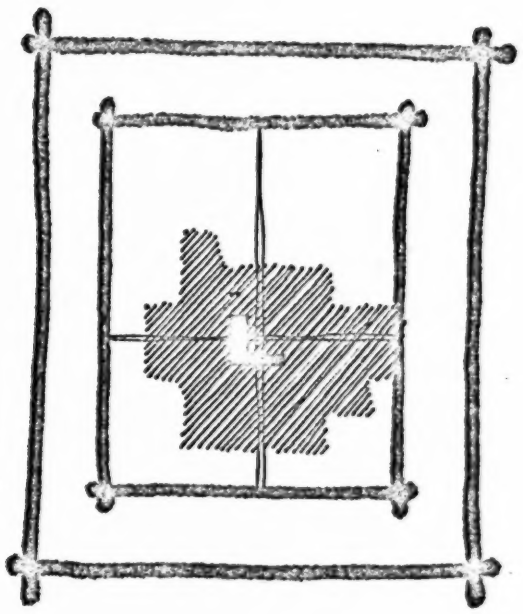
DUNBEATH is a medium sized city of 290,000 population encompassing a developed area of 42 square miles. There is, however, a large amount of privately owned undeveloped land within the core area as well as on the fringe, where zoning was recently obtained for a new industrial park.

The industrial and commercial area is centered within a two to three mile radius of the terminal, which is a focal point in the city. The low-income residential section of DUNBEATH extends into the northeast which contains a garden apartment complex at parcel 10026 comprising the worst slum in the city. The remaining low-income housing is of mediocre quality and generally overcrowded. The public facilities serving the northeast section of town are all inferior to those in the other parts of town. The school in the northeast is overcrowded, with a poor student-teacher ratio of 25-1 and a low value ratio of 65, compared to student teacher ratios of 15-1 or less and significantly higher value ratios in the other schools. The municipal services department is uniformly bad throughout the city as police and fire stations and hiring policies have continually lagged behind DUNBEATH's recent rapid growth. Likewise, the road system in the northeast has been allowed to deteriorate significantly. In addition, the bus service that exists does not serve the low income people of northeast. Finally, the planning and zoning department has failed to provide any parkland at all in the northeast residential area, while providing abundant parkland in the south and northwest.

The soutwest section of DUNBEATH is a high-income residential area where all public services, except municipal services, are plentiful and of high quality. The northwest neighborhoods and the few residential developments in the southeast are largely middle income with some higher income people.

The growth pattern of DUNBEATH has been a mad rush of land speculation and almost unrestricted development, with the municipal planning agency nothing more than a tool of the economic interests, granting all zoning changes requested. For this reason new developments have leapfrogged large tracts of undeveloped land to build housing on cheaper land further from the center city. This has resulted in a very uneconomic land use pattern with large totally vacant areas in and near the center of the city, particularly in the northern half of the city. With the election of a new mayor the question now arises whether such policies will continue and scattered development be the inevitable result.

LOTHIAN SCENARIO



LOTHIAN is a medium sized town of 50,000 people. This city is distributed over an area of 1/9 sq. mile parcels at a relatively low density of about 1,000/sq. mile. Thus, since LOTHIAN urban development occupies most of the board, this scenario will draw attention to intra-city aspects.

The west side is the older section of town and has deteriorated to a low-income residential area. The two heavy industries and the business goods firm have also deteriorated over the years to a point where they are operating at only about 70% of their peak efficiency. A swampy area winds its way from the terminal in a south-westerly direction. The municipal government has periodically proclaimed its determination to drain the swamp to make space available for new homes and parkland, but has not followed through on its promise.

LOTHIAN has grown toward the west along the main highway running east and west, because a new north-south interstate highway was built slightly less than two miles to the east of the older industrial complex. The principal commercial firms are located at the intersection of these two highways, comprising what is essentially the new downtown area. A new light industrial complex has grown up further to the east and the surrounding area has become the high-income neighborhood.

The Deveron River runs through the northeast section adding an appeal for wealthier families because of the scenic and recreational opportunities it offers.

As might be expected, the schools and other public services are better in the newer upper class section of the town than in either the lower or middle class residential sections. The student-teacher ratio and educational program, as well as the physical condition of the structures are all excellent in the northeastern school district. To the west the middle and low-income class areas have relatively poor quality of schooling. The school district in the far western section is inferior to all other districts.

Deteriorated conditions also exist in the case of municipal services. In addition there is much more parkland in the eastern half of the town, particularly bordering the river, than in the west. The road network provides equally good access for all sections of the town, although the roads are better maintained in the eastern portion. The Bus Department actually serves the low and middle income areas better than the high income areas.

LOTHIAN is currently experiencing extremely high unemployment due to the slackening of new construction. But it is expected that new construction starts will pick up shortly and the rate of unemployment will fall to no more than 5-6%. The housing vacancy rate is approximately 4% spread fairly evenly throughout the town.

APPENDIX J

DEFINITION OF LAND USE TYPES

CITY III Symbol	NAME	Standard Industrial Classification Code	Census Industry Group
HI	Heavy Industry (includes some non-durable goods but primarily durable goods manufacturing)	19 Ordinance	Other durable
		20 Goods	Food
		21 Tobacco	
		22 Textile	Textile
		23 Apparel	Apparel
		24 Lumber	Furniture and Lumber
		25 Furniture	
		26 Paper	
		29 Petroleum	
		32 Stone	
		33 Primary Metals	Primary ferrous Primary nonferrous
		35 Machinery	Machinery
		37 Trans. Equip.	Motor Vehicles Aircraft Other trans. Equip.
LI	Light Industry (includes some durable goods but primarily non-durable goods manufacturing	27 Printing	Printing
		28 Chemicals	Chemicals
		30 Rubber-plastic	Rubber-plastic
		31 Leather	Other nondurable
		34 Fabricated metals	Other durable
		36 Electrical machinery	Electrical machinery
		38 Instruments	Other durable
		39 Miscellaneous	Other nondurable
NS	National Services (national type services)	61 Credit agencies	
		62 Security dealers	
		63 Insurance carriers	Insurance
BG	Business Goods (goods sold to industries and local commercial)	50 Wholesale trade	Wholesale trade
		52 Building materials	

175

CITY III Symbol	NAME	Standard Industrial Classification Code	Census Industry Group
BS	Business Services (services sold primarily to businesses)	73 Miscellaneous Business Services 81 Legal Services 89 Miscellaneous Services	Business Services
PG	Personal Goods	53 Retail General Merchandise 54 Food Stores 55 Automotive dealers and service stations 56 Apparel and Accessory Stores 57 Furniture and home furnishing stores 58 Eating and drinking places 59 Miscellaneous Retail Stores	General Merchandise Food Stores Eating and drinking places Other Retail
PS	Personal Services	60 Banking 65 Real Estate 70 Hotels 72 Personal Services 75 Auto Repair 76 Miscelleneous Repair 78 Motion Pictures 79 Amusements	 Hotels Other Personal Service Repair Services Entertainment
MS	Municipal Services (excluding education)	----------	Public Administration (local part only)
SC	Schools (public only)	----------	Education Services Government
TM	Terminals	40 Railroad 42 Trucking & warehousing 44 Water Transportation 45 Air transportation 46 Pipeline Transportation 47 Transportation services	Railroads Trucking and warehousing Other Transportation
RAIL BUS	Rapid rail and bus	41 Local Urban Passenger Transit	
UT	Utilities	49 Electric, gas, and sanitary services	Utilities & sanitary Services

APPENDIX K

SIMULATION AND GAMING

A Select Bibliography

I. Articles

A. Urban Gaming

1. Feldt, Allan G., "Operational Gaming in Planning Education," Journal of the American Institute of Planners, XXXII, (January, 1966), pp. 17-23.

Feldt describes the use of CLUG (Cornell Land Use Game) in particular and operational gaming in general as an innovative device for Planning education. The motivation and retention achieved through the use of this technique is stressed and suggestions for further improvements are listed.

2. House, Peter and Patterson, Philip D., Jr., "An Environmental Gaming Simulation Laboratory," Journal of the American Institute of Planners, XXXV (November, 1969), pp. 383-388.

House and Patterson describe the need for a social science laboratory to be used by students and professionals to analyze man's environment and experiment with change. The City models developed by Envirometrics are introduced as a step in the direction of achieving such a laboratory.

3. Meier, Richard L. and Duke, Richard D., "Gaming Simulation for Urban Planning," Journal of the American Institute of Planners, XXXII, (January, 1966), pp. 3-17.

Meier and Duke emphasize that a gaming model will be a valuable tool in situations where political decisions relate to the quality of service and the range of consideration is imperfectly known. The Metropolis role-playing game is explained, as is the development of a future model (M.E.T.R.O.), intended to illuminate the implications of policy alternatives.

B. General

1. Long, Norton E., "The Local Community as an Ecology of Games," American Journal of Sociology, 64, (November, 1958), pp. 251-261.

This classic article describes how the local community can be usefully conceptualized as a collection of games in which the players in each game make use of players in other games for their particular purposes. Long holds that the interaction of the games produces unintended but systematically functional results.

2. Simulation and Games: An International Journal of Theory, Design and Research. Edited by Michael Inbar and Clarice Stoll. Sage Publications, Quarterly.

This new quarterly journal is intended to provide a forum for information interchange as well as theoretical and empirical articles and reviews concerning gaming and simulation activity.

3. Swanson, Carl V. and Waldmann, Raymond J., "A Simulation Model of Economic Growth Dynamics," Journal of the American Institute of Planners, XXXVI (September, 1970), pp. 314-322.

This small-area economic base study uses the computer simulation techniques of Industrial Dynamics and Urban Dynamics (see Jay Forrester). Using a set of fairly restrictive assumptions, the authors develop an inexpensive model to construct and use for policy guidance purposes.

II. Books

A. Gaming

1. Abt, Clark, Serious Games. New York: The Viking Press, 1970.

In this book, Abt explores the ways in which games can be used to instruct and inform. His references are primarily to elementary and secondary school games which he has designed.

7. Thorelli, Hans B. and Graves, Robert L., International Operations Simulations. London: Collier-MacMillan Ltd., The Free Press of Glencoe, 1964.

In addition to being a complete description of the INTOP (International Operations Simulation) business game, this book does an excellent job of discussing the purpose, design, and uses of management games. The first chapter is useful as a guide to game design.

B. Simulations

1. Emshoff, James R. and Sisson, Roger L., Design and Use of Computer Simulation Models. The MacMillan Company, New York, 1970.

This excellent book on management simulation models provides useful insights into general simulation model-building techniques and problems. A short chapter on the simulation of human behavior includes some discussion of the gaming methodology.

2. Forrester, Jay W., Urban Dynamics. Cambridge, Massachusetts Institute of Technology, 1969.

In this groundbreaking book, Forrester describes in full detail the development and operation of a dynamic single jurisdiction urban model. His documentation is very good, although the reader may disagree with some of the policy implications that are derived.

3. Guetzkow, Harold, editor, Simulation in Social Science: Readings. Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 1962.

The edited work has a good introduction to simulation and two particularly useful chapters on the simulation of economic systems (by Guy Orcutt) and the Carnegie Tech Management Game (by K. J. Cohen and others).

4. Isard, Walter, et.al., General Theory: Social, Political, Economic, and Regional with Particular Reference to Decision-Making Analysis. Cambridge, M.I.T. Press, 1969.

In this monumental (1040 pages) effort, Isard and associates attempt to develop a general theory of decision-making for regional and urban areas. Although mathematics is used for many proofs, several chapters are self-contained and of use to the general reader.

2. Boocock, Sarane S. and Schild, E.O., Simulation Games in Learning. Beverly Hills: Sage Publications, Inc., 1968.

This edited work deals with the educational use of games primarily at the elementary and secondary school levels. Emphasis is placed on the educational effects of games and on teaching games for validity.

3. Carlson, Elliot, Learning Through Games. Washington, D. C.: Public Affairs Press, 1969.

Intended for the general reader, this book relates how games are being used by schools, business firms, government agencies, and others to achieve a wide range of objectives. Carlson stresses the educational value of learning by doing.

4. Coplin, William D., editor, Simulation in the Study of Politics. Markham Publishing Company, 1968.

This edited work deals with simulations and games in international relations, urban affairs, organizational behavior, and politics. Of particular interest are the chapters on municipal budgeting and urban gaming.

5. Gamson, William A., SIMSOC: Simulated Society. The Free Press, New York, 1969.

Together, the instructor's and participant's manuals describe SIMSOC, a manually operated game that deals with the establishment and maintenance of social order. The game is intended to be used in conjunction with conventional classroom discussion and readings.

6. Shubik, Martin, editor, Game Theory and Related Approaches to Social Behavior. New York: John Wiley and Sons, Inc., 1964.

This edited work deals with a wide assortment of uses of game theory in the social sciences.

5. Raser, John R., Simulation and Society. Boston: Allyn and Bacon, Inc., 1969.

Raser's book provides some new insights into the relationship between gaming and simulation and lists six important stimulants provided by gaming to theory building (confrontation, explication, expansion, communication, involvement, and serendipity).